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SUMMARY

Thermodynamic and transport properties, including enthalpy, entropy, heat capacity, molecular weight, viscosity, and thermal conductivity, have been calculated for the $N_2O_4 \rightleftharpoons 2NO_2$ equilibrium and also the $N_2O_4 \rightleftharpoons 2NO_2 \rightleftharpoons 2NO+O_2$ equilibrium from 300° to 1280° K and from 0.01 to 100 atmospheres. The Prandtl number, Lewis number, isentropic exponent, and two derivatives involving the molecular weight, pressure, and temperature were also calculated. The Chapman-Enskog theory of monatomic gases was applied in the transport property calculations, with an Eucken-type correction to the thermal conductivity to account for internal degrees of freedom. An expression for the thermal conductivity due to chemical reaction was also included. The transport cross sections were calculated for the Lennard-Jones (12-6) potential, the parameters being obtained from analysis of experimental viscosity and thermal conductivity data. Also included in the calculations is a parameter, which may be useful in analyzing to what extent chemical reaction in the gas phase affects thermal conduction. This parameter is tabulated over the same pressure and temperature range over which the thermodynamic and transport properties were calculated.

INTRODUCTION

The dissociation of N_2O_4 has been of interest in heat-transfer studies because the effects of chemical reaction in the gas phase occur at pressures and temperatures convenient for experimental work (refs. 1 to 7). The chemical reactions describing the dissociation from the boiling point of N_2O_4 (294.3° K) to about 1300° K are given by

$$\text{(I)}\quad N_2O_4 \rightleftharpoons 2NO_2$$

$$\text{(II)}\quad 2NO_2 \rightleftharpoons 2NO+O_2$$

Reaction I goes essentially to completion before reaction II becomes important. At about 1300° K the NO begins to decompose.

Previous calculations are available for the thermodynamic and transport properties for this system (refs. 6 and 8). However, these previous calculations are for only a pressure of 1 atmosphere (ref. 8) or do not include the NO_2 dissocation (ref. 6). Furthermore, new measurements of the viscosity have become available (ref. 9), allowing more accurate estimates of the interaction potentials, and from these potentials improved transport property calculations. Therefore, thermodynamic and transport properties have been calculated over a wide pressure range (0.01 to 100 atm) and up to 1280° K, at which point the NO_2 is almost completely dissociated. Frozen and equilibrium properties have been calculated, first assuming only reaction I occurs, and second assuming both reactions I and II occur.

EXPERIMENTAL DATA ANALYSIS

Experimental measurements have been reported on both the viscosity and thermal conductivity from room temperature to almost 500° K (refs. 9 to 12), the temperature range where reaction I is predominant. However, the experimental viscosity data of the various workers has shown some large differences. Therefore, the data of the various authors were analyzed in terms of rigorous transport theory for the viscosity of gas mixtures (ref. 13) in order to clarify these differences. The analysis consisted of fitting the experimental viscosity data to the Lennard-Jones (12-6) potential, using the derived constants to calculate both the viscosity and the thermal conductivity, and then comparing the experimental and calculated results. When possible, the derived constants were compared to constants of other molecules of similar size and shape. The constants derived from the experimental viscosity data of Petker and Mason (ref. 9) appeared to be the most reasonable when compared to constants of similar molecules. Furthermore, better agreement between the experimental and calculated viscosity data was found for the data of Petker and Mason than for the experimental viscosity data of references 10 and 11. That is, the constants obtained from the data of reference 9 more closely reproduced the experimental data from which they were derived than did the constants obtained from the data of references 10 and 11.

In the analysis two cases were considered. The gas was assumed to be composed of (1) an equilibrium mixture of NO_2 and N_2O_4 and (2) an equilibrium mixture of NO_2, N_2O_4, NO, and O_2.

The force constants for the $N_2O_4 \rightleftharpoons 2NO_2$ equilibrium system were determined by the following procedure. For the N_2O_4-N_2O_4 interaction ϵ/k was estimated from the following relationship (ref. 14):

$$\frac{\epsilon}{k} = 1.18\ T_b \tag{1}$$

(Symbols are defined in appendix A.) For the NO_2-NO_2 interaction ϵ/k was assigned four trial values of 190, 210, 230, and 250. This range of 190 to 250 for ϵ/k was selected because it encompassed the range considered reasonable for $(\epsilon/k)_{NO_2\text{-}NO_2}$. For each trial value $(\epsilon/k)_{NO_2\text{-}N_2O_4}$ was determined by the usual combining rule (ref. 13)

$$\left(\frac{\epsilon}{k}\right)_{12} = \sqrt{\left(\frac{\epsilon}{k}\right)_{11}\left(\frac{\epsilon}{k}\right)_{22}} \tag{2}$$

For each trial value the three corresponding values of σ, namely, $\sigma_{NO_2\text{-}NO_2}$, $\sigma_{NO_2\text{-}N_2O_4}$, and $\sigma_{N_2O_4\text{-}N_2O_4}$ were determined simultaneously by a least-squares fit of the experimental viscosity data. The best set of constants (in a least squares sense) was then selected from among the four sets. The entire procedure was then repeated, the only difference being that $\sigma_{NO_2\text{-}N_2O_4}$ was determined from the combining rule (ref. 13)

$$\sigma_{12} = \frac{1}{2}(\sigma_{11} + \sigma_{22}) \tag{3}$$

That is, only $\sigma_{NO_2\text{-}NO_2}$ and $\sigma_{N_2O_4\text{-}N_2O_4}$ were determined by a simultaneous least-squares fit of the viscosity data, and $\sigma_{NO_2\text{-}N_2O_4}$ was subject to the constraint of equation (3). The best set of constants among these four was then selected. This then completed the analysis of the $N_2O_4 \rightleftharpoons 2NO_2$ equilibrium.

Next the $N_2O_4 \rightleftharpoons 2NO_2 \rightleftharpoons 2NO+O_2$ equilibrium system was examined. For this system force constant for the NO_2-NO_2, NO_2-N_2O_4, and N_2O_4-N_2O_4 interactions were determined the same way as for the $N_2O_4 \rightleftharpoons 2NO_2$ system. Now, however, force constants for the additional interactions NO-NO, O_2-O_2, NO_2-NO, NO_2-O_2, N_2O_4-NO, N_2O_4-O_2, and NO-O_2 were also needed. For the NO-NO and O_2-O_2 interactions the force constants given in reference 14 were used. These particular constants were determined from experimental viscosity data of pure NO and O_2. In each case the experimental viscosity data used in reference 14 covered a temperature range very nearly the same as that considered herein, and therefore the derived constants should be appropriate for the present calculations. For the other five unlike interactions (NO_2-NO, NO_2-O_2, N_2O_4-NO, N_2O_4-O_2 and NO-O_2) the combining rules, equations (2) and (3), were used.

Therefore, four different situations were examined, the equilibrium $N_2O_4 \rightleftharpoons 2NO_2$

system, the equilibrium $N_2O_4 \rightleftharpoons 2NO_2 \rightleftharpoons 2NO+O_2$ system, and for each equilibrium two methods of determining $\sigma_{NO_2-N_2O_4}$.

The results showed that a slightly better fit to the viscosity data was obtained by assuming only reaction I occurred. This was found to be true for $\sigma_{NO_2-N_2O_4}$ obtained from the combining rule and also for $\sigma_{NO_2-N_2O_4}$ obtained by least squares. This would suggest that reaction II had not appreciably progressed to the right during the course of the experimental measurements. This notion is supported by experimental kinetic data (refs. 15 to 17), which indicate that the rate of decomposition of NO_2 is rather slow and becomes appreciable only at the highest temperatures and pressures considered by Petker and Mason. (Their experimental viscosity data covered the range 0.5 to 5 atm and 25° to 170° C.) However, even for the condition most favorable for decomposition from thermodynamic considerations (0.5 atm and 170° C), at equilibrium only 2 percent of the NO_2 is decomposed, and for the condition most favorable from kinetic considerations, (5 atm and 170° C) NO_2 decomposition is only 1 percent. Therefore, since it is known that reaction I reaches equilibrium very rapidly, the constants derived assuming an equilibrium mixture of NO_2-N_2O_4 were considered the more realistic Lennard-Jones (12-6) parameters and were used in the calculations herein.

In order to compare the two methods of determining $\sigma_{NO_2-N_2O_4}$, transport properties were calculated using the $\sigma_{NO_2-N_2O_4}$ determined by both methods. Necessarily the value obtained by least squares gave a better fit to the viscosity data. The improvement was so slight, however, that the $\sigma_{NO_2-N_2O_4}$ determined by least squares could not be judged a better value. The thermal conductivity data calculated for each $\sigma_{NO_2-N_2O_4}$

TABLE I. - LENNARD-JONES (12-6) POTENTIAL FORCE CONSTANTS FOR THE NO-NO_2-O_2-N_2O_4 SYSTEM

Interaction	σ, Å	ϵ/k, $^\circ K$	Method of determination of σ and ϵ/k
NO-NO	3.492	116.7	Ref. 14
NO-NO_2	3.628_5	156.5	Eqs. (2) and (3)
NO-N_2O_4	4.056_5	201.2	Eqs. (2) and (3)
NO-O_2	3.479_5	111.6	Eqs. (2) and (3)
NO_2-NO_2	3.765	210	Least-squares fit of viscosity data for σ and ϵ/k
NO_2-N_2O_4	4.193	270	Eqs. (2) and (3)
NO_2-O_2	3.616	149.7	Eqs. (2) and (3)
N_2O_4-N_2O_4	4.621	347	Least-squares fit of viscosity data for σ and eq. (1) for ϵ/k
N_2O_4-O_2	4.044	192.4	Eqs. (2) and (3)
O_2-O_2	3.467	106.7	Ref. 14

were also compared. Since the contribution of the thermal conductivity due to chemical reaction is particularly sensitive to the unlike interactions, comparison of the calculated conductivity data should provide a critical test of the relative merits of the two $\sigma_{NO_2-N_2O_4}$. As was found for the viscosity, however, the two sets of calculations were in close agreement. Therefore, in order to be consistent with the method of determining the constants of the other unlike interactions and to minimize the number of adjustable parameters, $\sigma_{NO_2-N_2O_4}$ was calculated by equation (3).

Table I gives a summary of the force constants used in the calculations herein and the method of determining each.

When compared to constants of similar molecules, such as N_2O and CO_2, the constants for NO_2 appear reasonable. However, since it was found in the analysis that there was a range of sets of force constants, which reproduced the experimental viscosity data about equally well, these constants should not be considered the "true" constants, but merely as suitable ones, which will reproduce the experimental data about as well as, or better than, any other set.

As expected, the constants for N_2O_4 are substantially larger than those for NO_2. An approximate value of $\sigma_{N_2O_4}$ can be estimated from the boiling point density. Using equations proposed in references 13 ($2/3\ \pi N\sigma^3 = 2.0 V_b$) and 14 ($2/3\ \pi N\sigma^3 = 2.0\ V_b - 5$), and a boiling point density of 1.443 (interpolated from N_2O_4 liquid densities given in refs. 18 and 19), gives values of σ of 4.66 and 4.60, respectively. Since the value given in table I lies between these two, it does appear to be reasonable.

CALCULATION OF PROPERTIES

The thermodynamic and transport properties were calculated using the program described in reference 20. Calculations were performed for both the equilibrium NO_2-N_2O_4 system and the equilibrium NO_2-N_2O_4-NO-O_2 system from 300° to 1280° K and from 0.01 to 100 atmospheres. The properties designated as frozen are for the equilibrium composition at the corresponding temperature and pressure.

Briefly, the rigorous Chapman-Enskog theory for gas mixtures was applied for the transport property calculations herein. Though the theory assumes only binary collisions of monatomic gases, it has been shown to apply satisfactorily to the viscosity of mixtures of polyatomic gases as well as to the viscosity and thermal conductivity of mixtures of monatomic gases (ref. 21). For the thermal conductivity the contribution of the translational conductivity was calculated from the theory which is rigorous for a mixture of monatomic gases. A modified Eucken-type expression was added to account for the contribution of the internal energy states, and the thermal conductivity due to chemical reaction was calculated from the equation developed in references 22 and 23.

TABLE II. - STANDARD STATE (ZERO PRESSURE) ENTHALPIES AT 0^{o} AND 298.15^{o} K (REF. 26)

Molecule	Standard state enthalpy, H_T^o, cal/g-mole	
	H_0^o	$H_{298.15}^o$ (a)
NO	19 402.955	21 600.000
NO_2	5 570.344	8 007.475
N_2O_4	-1 569.312	2 348.836
O_2	-2 074.739	0

[a]Values at 298.15^{o} K are also heats of formation at this temperature.

The transport cross sections were all calculated for the Lennard-Jones (12-6) potential and included the third approximation for the viscosity (ref. 13). The force constants for the various interactions have been summarized in table I.

The details of the thermodynamic property calculations may be found in references 24 and 25. Values of standard state enthalpies of the pertinent molecules are given in table II for convenience in converting enthalpies to a different reference value.

DISCUSSION OF RESULTS

The thermodynamic and transport properties are given in tables III and IV, respectively. Equilibrium properties, for reaction I have been calculated for 0.01, 0.1, 1, 10, and 100 atmospheres from 300^{o} to 1280^{o} K at 20^{o} K intervals. Properties designated as frozen are for the equilibrium composition. Similar calculations are also included for pressures of 0.01, 0.03, 0.1, 0.3, 1, 3, 10, 30, and 100 atmospheres, assuming both reactions I and II occur.

The thermodynamic properties of table III are in substantial agreement with the data of Brokaw (ref. 6) and Fan and Mason (ref. 8). However, the viscosity and thermal conductivity data of table IV are somewhat higher than the calculated data of reference 6; they are also higher than that of reference 8 in the lower temperature region, where NO_2 and N_2O_4 are the predominant constituents. These differences in the transport properties are attributed to the differences in the Lennard-Jones (12-6) force constants used in the calculations, especially the constants for the NO_2-NO_2 and N_2O_4-N_2O_4 interactions. Whereas the force constants used herein were obtained from the experimental data of reference 9, the data of references 6 and 8 were calculated using estimated constants (ref. 6) for the NO_2-NO_2 and N_2O_4-N_2O_4 interactions. The viscosities calculated from these estimated constants are lower than the experimental data of Petker and Mason (ref. 9). At the higher temperatures the NO_2 is dissociated into NO and O_2. Since the force constants used in reference 8 for the NO-NO and O_2-O_2 interactions and those used in the calculation of table IV are about the same, the transport properties are in substantial agreement at the higher temperatures.

Table V, given in appendix B, presents values of a chemical kinetic parameter φ

for the $N_2O_4 \rightleftharpoons 2NO_2$ and $2NO_2 \rightleftharpoons 2NO{+}O_2$ reactions. This parameter indicates the extent to which gas phase chemical reaction affects thermal conduction or heat transfer in reacting gas systems. It is defined as

$$\varphi \equiv \left[\left(\frac{\lambda_e}{\lambda_r \lambda_f}\right)\left(\frac{\Delta H}{RT}\right)^2 R\mathcal{R}\right]^{1/2} \tag{4}$$

where $\mathcal{R}$ is the reaction rate in either direction at equilibrium and ΔH is the heat of reaction at temperature T. The calculation of this parameter is discussed in appendix B.

The dimensionless quantity $(\varphi \ell)^2$, where ℓ is a dimension characteristic of the system, involves among other things a ratio of a diffusion time to a chemical relaxation time (ref. 27). Consequently, it is closely related to Damköhlers first group, which is the ratio of a time associated with a flow to a chemical time.

The values of φ from table V (p. 19) have been used to correct the experimentally

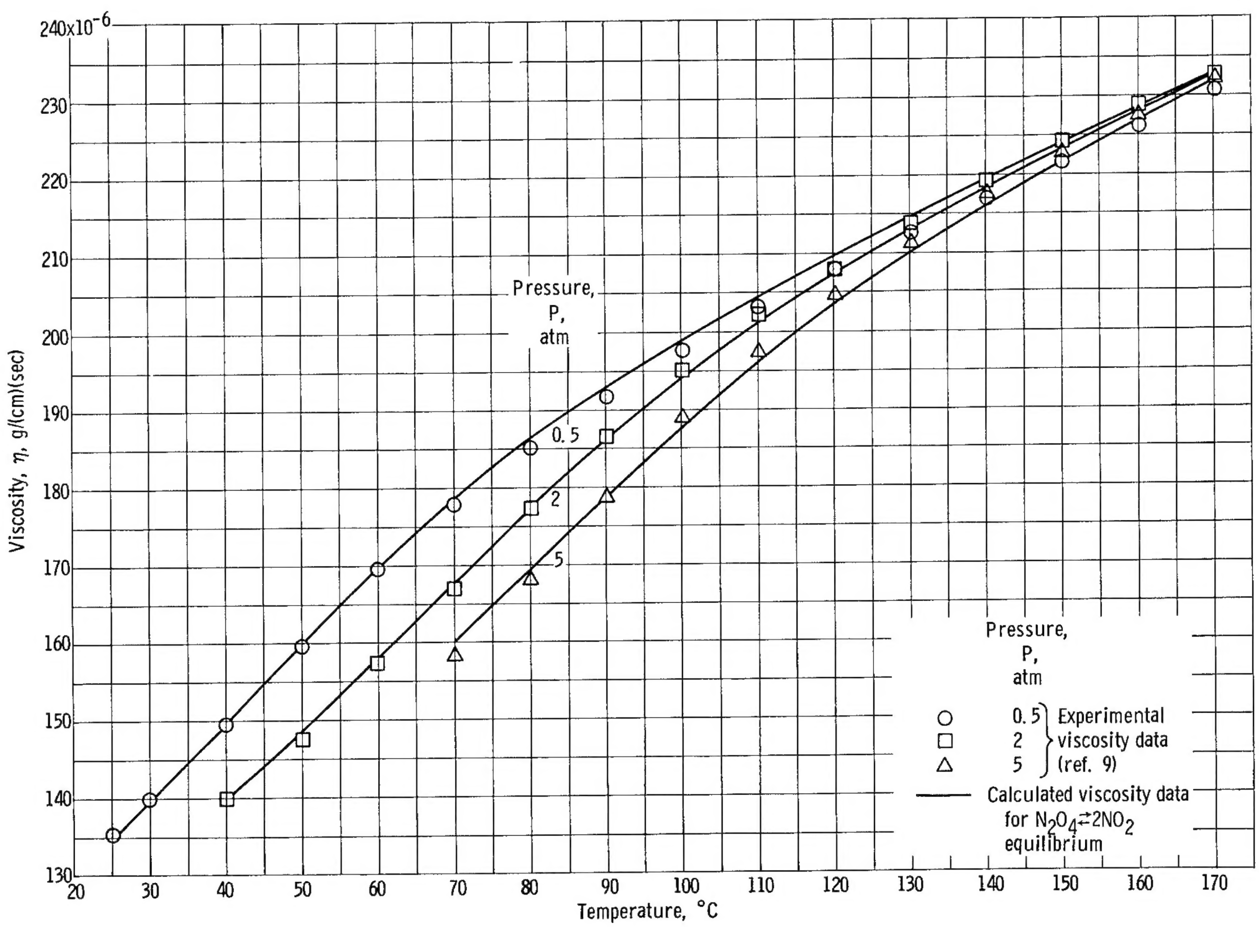

Figure 1. - Experimental and calculated viscosity as a function of temperature.

observed heat conductivities for the $N_2O_4 \rightleftarrows 2NO_2$ system to equilibrium values, as described in appendix B. Appendix C provides an example of how the chemical kinetic parameter φ may be useful in predicting convective heat transfer in situations where the chemistry is neither completely at equilibrium nor completely frozen.

Figure 1 (p. 7) shows the calculated viscosity data, assuming the equilibrium NO_2-N_2O_4 mixture, at pressures of 0.5, 2, and 5 atmospheres from 25^o to 170^o C. Also included are the experimental data of reference 9. Experimental data at 1 and 3 atmospheres are also reported in reference 9, but these data were not included in figure 1 because of space limitation, and the crossover of the data at high temperatures. This crossover of the experimental isobaric viscosity curves was not confirmed by either the NO_2-N_2O_4 or the NO_2-N_2O_4-NO-O_2 equilibrium calculations. Nor is it possible to explain this phenomenon by hypothesizing partial dissociation of the NO_2 to NO and O_2,

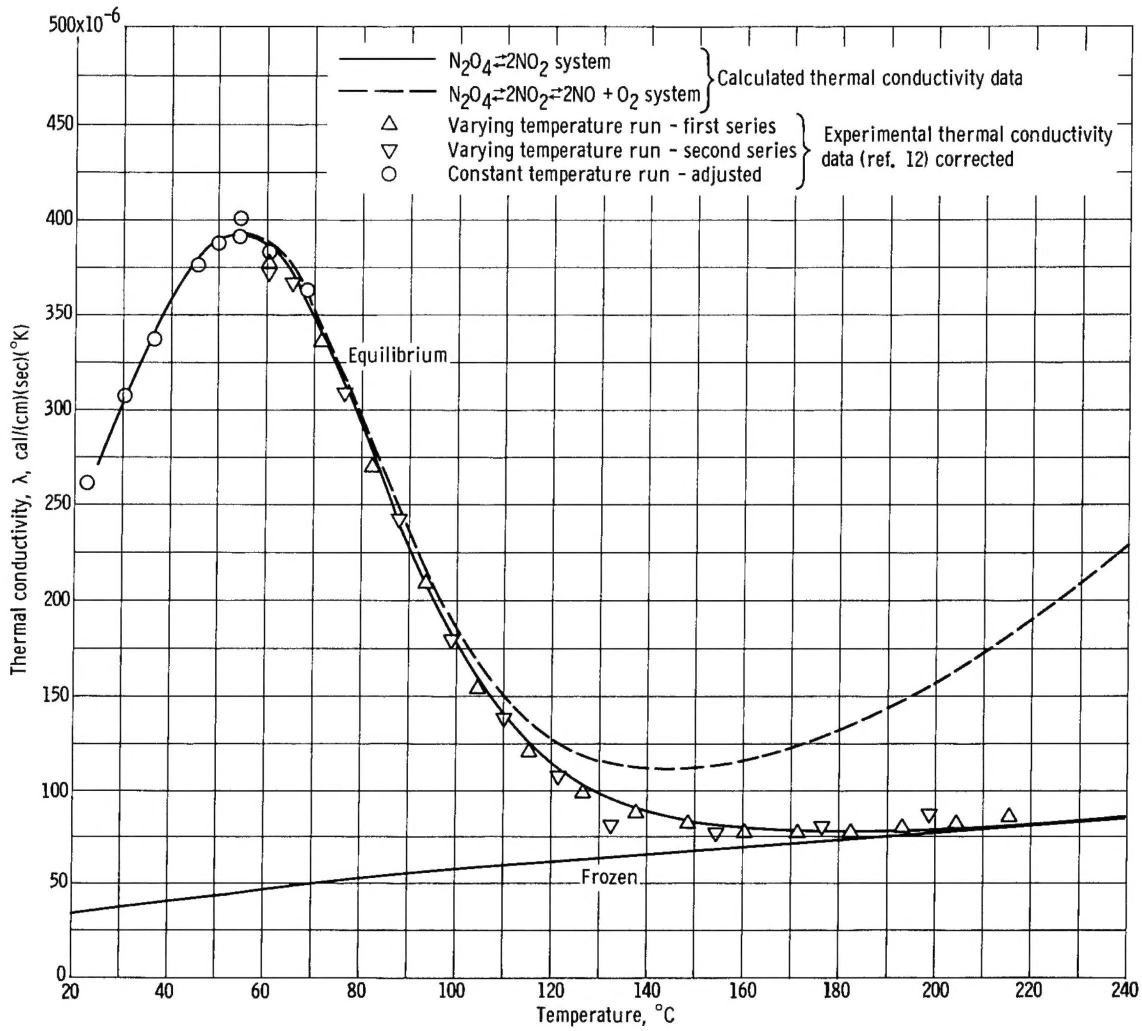

Figure 2. - Experimental and calculated thermal conductivity as a function of temperature at 1 atmosphere.

inasmuch as under the condition most favorable for dissociation (0.5 atm and 170° C) the dissociation at equilibrium would be only 2 percent, as mentioned previously. The calculations of table IV show this is not enough to produce a sufficient change in the viscosity to explain the crossover. Despite the fact that the calculated data did not show this experimentally observed crossover, the standard deviation, in terms of percent of the average experimental viscosity, for all the experimental data was only 0.54 percent. The maximum difference between the experimental and calculated data was 1.20 percent.

Figure 2 shows similar results for frozen and equilibrium thermal conductivities at 1 atmosphere. Included are the experimental data of Coffin and O'Neal (ref. 12). Their data have been corrected for two effects. First, Coffin and O'Neal used the helium conductivity data of Kannuluik and Carman (ref. 28) to calibrate their thermal conductivity cell. An analysis of viscosity and heat conductivity data of helium in terms of rigorous kinetic theory suggests (ref. 29) that Kannuluik and Carman's values are 3 to 5 percent too low. Consequently, the heat conductivities reported by Coffin and O'Neal were corrected as described in reference 21, using the smoothed helium thermal conductivities of reference 29. (The nitrogen thermal conductivities also used in the calibrations of the apparatus described in ref. 12 seem reasonable and were assumed to be correct.)

The second correction accounted for the fact that the reaction $N_2O_4 \rightleftharpoons 2NO_2$ proceeds at a finite rate. The theoretical analysis of reference 27, which studies the effect of geometry, gas phase diffusion and relaxation times, surface reactions, and accommodation coefficients, was applied. Temperature jump at the surface was ignored, and surface reaction was assumed negligible. A discussion of the details of this correction is given in appendix B. Corrections were negligible above about 130° C, and the maximum total correction, which was just under 5 percent, occurred at the peak of the conductivity curve.

Above about 100° C the thermal conductivity curves calculated for the equilibrium NO_2-N_2O_4 and NO_2-N_2O_4-NO-O_2 curves separate because of the effect of the $NO_2 \rightleftharpoons 2NO+O_2$ reaction on the NO_2-N_2O_4-NO-O_2 system. The experimental data clearly tend to follow the NO_2-N_2O_4 equilibrium more closely. This would indicate that NO_2 decomposition did not occur rapidly either in the gas phase or on the surfaces. This result is consistent with the values of φ shown in table V of appendix B. Since φ is a measure of the contribution of the gas phase reaction to the thermal conductivity, comparison of φ for the $N_2O_4 \rightleftharpoons 2NO_2$ reaction to the value of φ for the $2NO_2 \rightleftharpoons 2NO+O_2$ reaction represents the relative contribution of each reaction to the reaction conductivity. Since φ for the $N_2O_4 \rightleftharpoons 2NO_2$ reaction is some four orders of magnitude greater than for the $2NO_2 \rightleftharpoons 2NO+O_2$ reaction, the experimental thermal conductivity should be closer to the equilibrium curve in the temperature range where the first reaction is predominant than it should be in the temperature range where the second reaction is predominant. This is observed in figure 2.

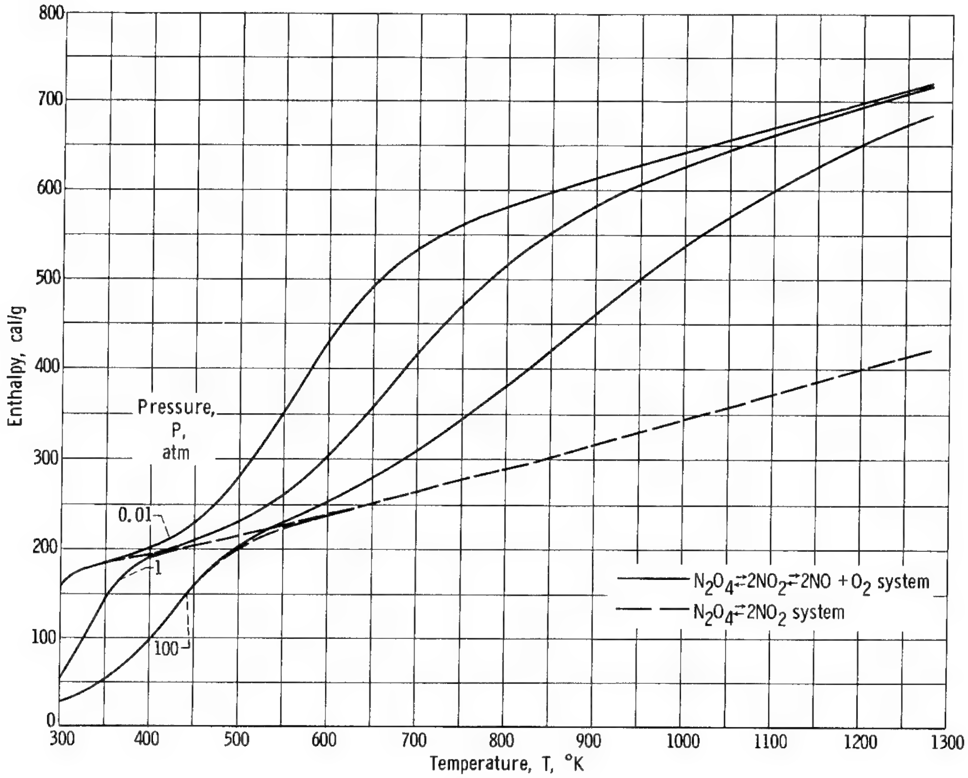

Figure 3. - Enthalpy as a function of temperature.

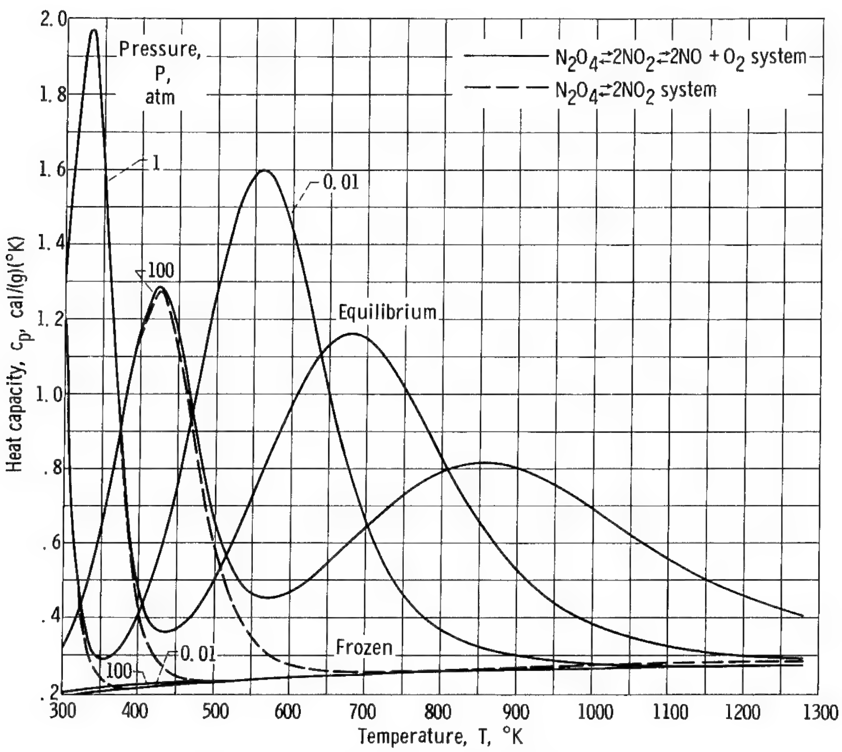

Figure 4. - Heat capacity (c_p) as a function of temperature.

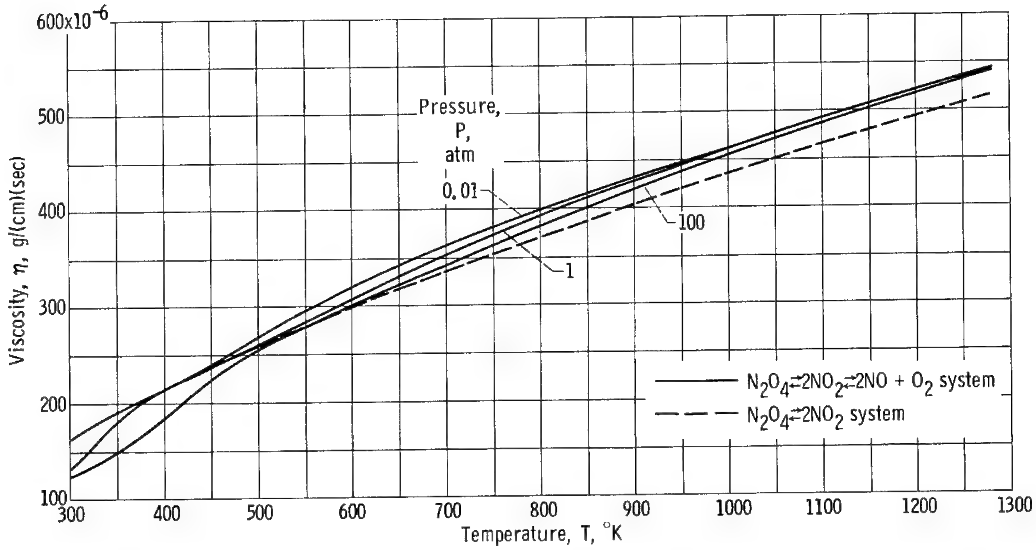

Figure 5. - Viscosity as a function of temperature.

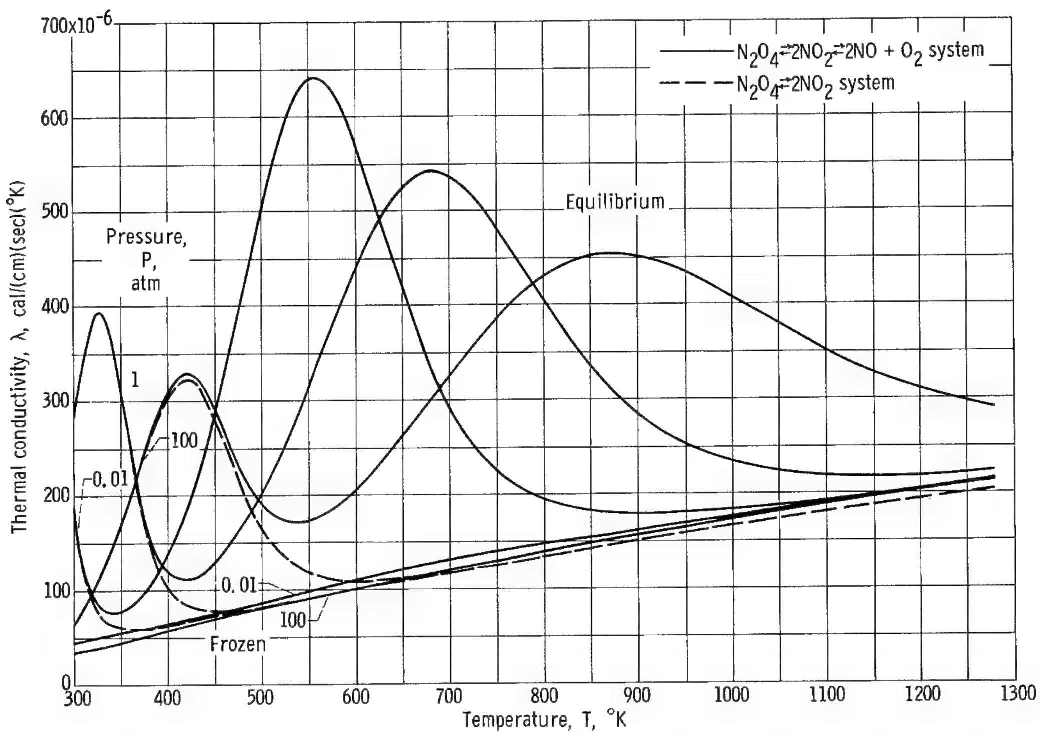

Figure 6. - Thermal conductivity as a function of temperature.

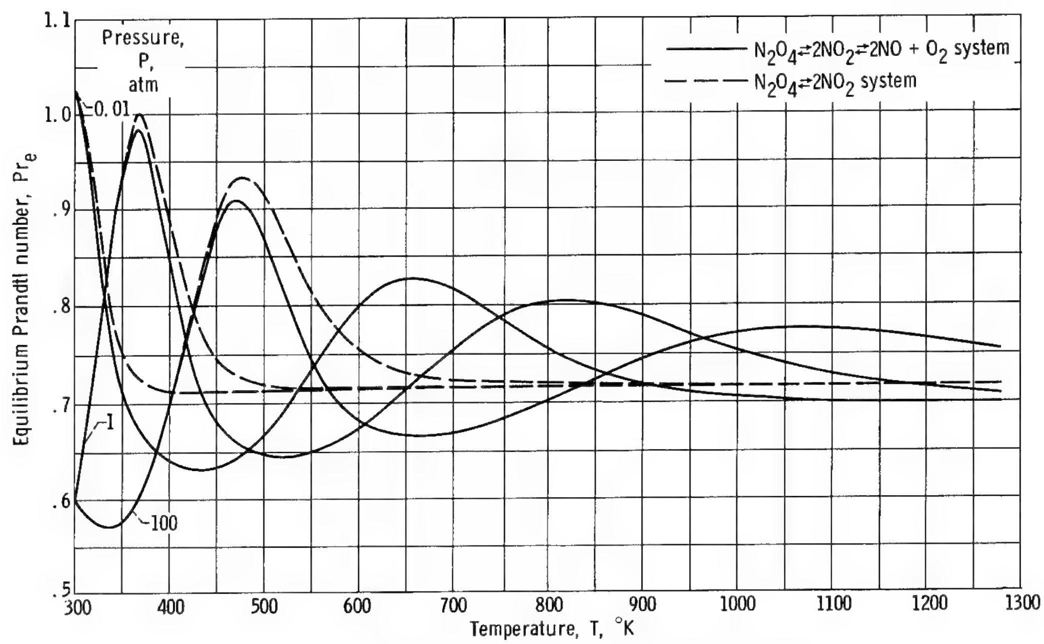

Figure 7. - Equilibrium Prandtl number as a function of temperature.

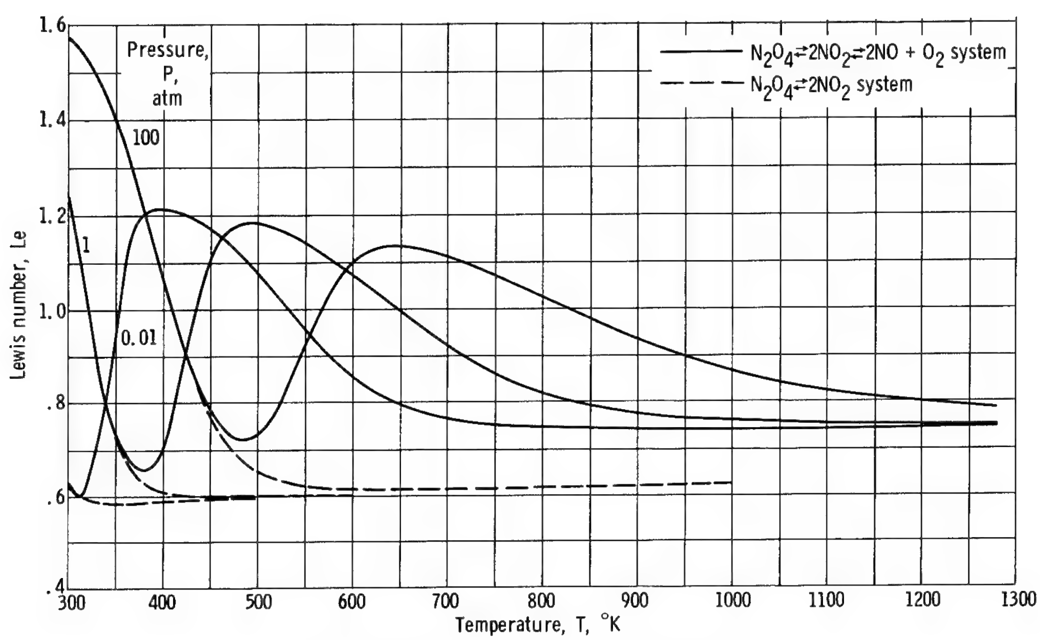

Figure 8. - Lewis number as function of temperature.

Figures 3 to 8 (pp. 10 to 12) show the enthalpy, heat capacity, viscosity, thermal conductivity, Prandtl number, and Lewis number, respectively, at pressures of 0.01, 1, and 100 atmospheres for the NO_2-N_2O_4 and NO_2-N_2O_4-NO-O_2 equilibria. Frozen properties are also included for the enthalpy, heat capacity, viscosity, and thermal conductivity for comparison. The shifting of the curves with changing pressure is caused by the composition changes associated with the pressure change. The curves for the equilibrium thermal conductivity and heat capacity clearly show where the chemical reaction contributes the most. The first peak is due primarily to the $N_2O_4 \rightleftarrows 2NO_2$ reaction, whereas, the second peak corresponds to the $2NO_2 \rightleftarrows 2NO+O_2$ reaction.

Because of these peaks the interpolation of the data for the equilibrium heat capacity and thermal conductivity, is rather difficult using standard interpolation equations. Therefore, an interpolation scheme, based on theoretical considerations, is described in appendix D for interpolation of c_{p_r} and λ_r. These two properties may then be added to c_{p_f} and λ_f to obtain c_{p_e} and λ_e, respectively. Properties other than c_{p_r} and λ_r do not show such serious variation with pressure and temperature, and standard interpolation equations may be used.

Lewis Research Center,
National Aeronautics and Space Administration,
Cleveland, Ohio, December 2, 1965.

APPENDIX A

SYMBOLS

A	coefficient in equation (C2), dimensionless
c_p	heat capacity at constant pressure, cal/(g)(^oK)
c_p^*	effective "heat capacity", cal/(g)(^oK)
c_{p_r}	$c_{p_e} - c_{p_f}$, cal/(g)(^oK)
D_{ik}	binary diffusion coefficient between molecules i and k, cm^2/sec
d	characteristic distance in Nusselt and Reynolds numbers, cm
ΔH	heat of reaction, cal
H_T^o	standard state enthalpy at temperature T, cal/g-mole
h	heat transfer coefficient, cal/$(cm)^2$(sec)(^oK)
K_p	equilibrium constant in terms of partial pressures
K_ν	modified Bessel function of the second kind of order ν
k	Boltzmann constant, 1.38044×10^{-16} ergs/^oK
k_i	rate constant of reaction i, consistent units
Le	Lewis number, $(\lambda_r)(c_{p_f})/(\lambda_f)(c_{p_r})$, dimensionless
ℓ	characteristic distance associated with parameter φ, cm
M	molecular weight, g/g-mole
N	Avogadro's number, 6.023×10^{23} molecules/g-mole
Nu	Nusselt number, hd/λ, dimensionless
P	pressure, atm
Pr	Prandtl number, $c_p\eta/\lambda$, dimensionless
q	heat transfer rate, cal/(cm^2)(sec)
R	gas constant, 1.98726 cal/(g-mole)(^oK)
R'	gas constant, 82.057 (cc)(atm)/(g-mole)(^oK)
Re	Reynolds number, $du\rho/\eta$, dimensionless
$\mathcal{R}$	reaction rate, g-mole/(cc)(sec)
r	radius, cm
s	entropy, cal/(g)(^oK)
T	temperature, ^oK
t	time, sec
u	linear flow velocity, cm/sec
V	volume, cc
x	mole fraction, dimensionless
γ	isentropic exponent, $(\partial \ln P/\partial \ln \rho)_s$, dimensionless
δ	correction to λ^* defined in eq. (B3), dimensionless
ϵ	force constant for Lennard-Jones (12-6) potential, ergs

η viscosity, g/(cm)(sec)

λ thermal conductivity, cal/(cm)(sec)(^{O}K)

λ^* effective "thermal conductivity", cal/(cm)(sec)(^{O}K)

ρ density, g/cc

σ force constant in Lennard-Jones (12-6) potential, Å

φ reaction rate parameter defined by eq. (4), cm^{-1}

Subscripts:

b boiling point

e equilibrium

f frozen

r reaction

APPENDIX B

EFFECT OF FINITE REACTION RATE ON THE EQUILIBRIUM THERMAL CONDUCTIVITY FOR THE $N_2O_4 \rightleftarrows 2NO_2 \rightleftarrows 2NO+O_2$ SYSTEM

In reference 27 the effective "thermal conductivity" of a reacting gas, ignoring thermal diffusion, is examined for particular geometries that can be described by a single coordinate r. An equation of the following form is developed for a single reversible reaction:

$$\lambda^* = \frac{\lambda_e \lambda_f}{\lambda_f + F\lambda_f + G\lambda_r} \tag{B1}$$

where λ^* is the effective "thermal conductivity" and F and G are functions of the coordinate r, the accommodation coefficients, the surface catalysis, and the reaction rate.

Consider the application of equation (B1) to a hot wire thermal conductivity cell. Assume chemical reactions at the surfaces are negligible and that temperature jump can be ignored. Then, from the results of reference 27 for concentric cylinders, a good approximation of equation (B1) is given by

$$\lambda^* = \frac{\lambda_e}{1 + \dfrac{K_0(\varphi r_1)}{\varphi r_1 K_1(\varphi r_1) \ln (r_2/r_1)}\left(\dfrac{\lambda_r}{\lambda_f}\right)} \tag{B2}$$

where r_1 and r_2 are the respective radii of the hot wire and the inner wall of the cell, the K_ν are modified Bessel functions of the second kind of order ν, and φ is given by equation (4). Solving for λ_e results in

$$\lambda_e = \lambda^* \left[1 + \frac{K_0(\varphi r_1)}{\varphi r_1 K_1(\varphi r_1) \ln (r_2/r_1)}\left(\frac{\lambda_r}{\lambda_f}\right)\right] = \lambda^*(1 + \delta) \tag{B3}$$

where δ is a correction term. Equation (B3) was used to correct the data of Coffin and O'Neal (ref. 12) for finite reaction rate as follows. For each experimental datum point,

a value of δ was calculated. Then the experimental conductivity λ^*, together with δ, were used to calculate λ_e. These equilibrium thermal conductivity values are the ones shown in figure 2 (p. 8), referred to as experimental data.

For the apparatus of Coffin and O'Neal $r_1 = 6.48\times10^{-3}$ centimeter and $r_2/r_1 = 37.1$. The values of φ were calculated from equation (4). Data for λ_e, λ_f, and λ_r were obtained from table IV and the $\Delta H/RT$ were obtained from reference 26. The only other quantity needed to calculate φ was the reaction rate $\mathcal{R}$. The calculation of $\mathcal{R}$ involved the following analysis of experimental kinetic data.

Since the reactions $N_2O_4 \rightleftharpoons 2NO_2 \rightleftharpoons 2NO+O_2$ occur simultaneously, the results of reference 27 are not strictly applicable. However, the thermodynamics of the system are such that the first reaction goes almost to completion before the second one becomes important, especially at lower pressure. Furthermore, the kinetics of the reactions (refs. 15, 16, 17, 30, 31, and 32) show that the first is much faster than the second. This means it is possible to ignore the second reaction when considering the first.

Experimental data of Carrington and Davidson on the first reaction (ref. 30) indicate that at high pressure the rate is first order with respect to N_2O_4, whereas at low pressure the rate is second order. A mechanism for this is suggested from the Lindemann-Hinshelwood theory by the following pair of reactions:

$$\text{(III)} \qquad N_2O_4 + M \underset{k_{-1}}{\overset{k_1}{\rightleftharpoons}} N_2O_4^* + M$$

$$\text{(IV)} \qquad N_2O_4^* \underset{k_{-2}}{\overset{k_2}{\rightleftharpoons}} 2NO_2$$

where M is a second body, either a different kind of molecule or another N_2O_4, and $N_2O_4^*$ is an activated N_2O_4. The rate of disappearance of N_2O_4 is given by

$$\frac{-d\left[N_2O_4\right]}{dt} = k_1\left[N_2O_4\right]\left[M\right] - k_{-1}\left[N_2O_4^*\right]\left[M\right] \tag{B4}$$

where the brackets around the chemical formulas signify concentrations.

If it is assumed that the rate of disappearance of $N_2O_4^*$ is much greater than the rate of formation, the steady state assumption $d\left[N_2O_4^*\right]/dt \cong 0$ may be applied, that is,

$$\frac{d[N_2O_4^*]}{dt} = k_1[N_2O_4][M] - k_{-1}[N_2O_4^*][M] - k_2[N_2O_4^*] + k_{-2}[NO_2]^2 = 0 \tag{B5}$$

Solving for $[N_2O_4^*]$, substituting into equation (B4), and then rearranging terms gives

$$-\frac{d[N_2O_4]}{dt} = \left(\frac{k_1}{\frac{k_{-1}}{k_2}[M] + 1}\right)[N_2O_4][M] - \left(\frac{k_{-2}}{[M] + \frac{k_2}{k_{-1}}}\right)[NO_2]^2[M] \tag{B6}$$

Thus the rate of disappearance of N_2O_4 in the forward direction is

$$\mathcal{R} = \left(\frac{k_1}{\frac{k_{-1}}{k_2}[M] + 1}\right)[N_2O_4][M] \tag{B7}$$

At low pressures the limiting rate is

$$\lim_{[M]\to 0} \mathcal{R} = k_1[N_2O_4][M] = k_{II}[N_2O_4][M] \tag{B8}$$

where k_{II} is the second order rate constant. At high pressures the limiting rate is

$$\lim_{[M]\to\infty} \mathcal{R} = \left(\frac{k_2}{k_{-1}} k_1\right)[N_2O_4] = k_I[N_2O_4] \tag{B9}$$

where k_I is the first order rate constant. Combining these results gives

$$\mathcal{R} = \frac{k_{II}[N_2O_4][M]}{\frac{k_{II}}{k_I}[M] + 1} \tag{B10}$$

Since the value of $\mathcal{R}$ in equation (4) is calculated at equilibrium, the values of $[M]$, which is the total concentration, and $[N_2O_4]$ may be taken from table III. Shock tube studies of the rate of dissociation of N_2O_4 in a large excess of N_2 have given first and

second order rates of $-d[N_2O_4]/dt = 10^{16} \exp(-13\ 000/RT)[N_2O_4]$ and $-d[N_2O_4]/dt = 2\times10^{17} \exp(-11\ 000/RT)[N_2O_4][N_2]$ gram-moles per cubic centimeter per second, respectively (ref. 30). The reported first order rate constant was the value used herein. However, other workers have found that NO_2 and N_2O_4 are more efficient second bodies than N_2 (refs. 31 and 32). Their results show that the second order rate constant should be approximately two to three times that found by Carrington and Davidson when NO_2 and N_2O_4 are the second bodies. Furthermore, analysis of experimental thermal conductivity data (ref. 27) suggests a value of about 3.5 times that found in reference 30. In view of these findings a value of 2.5 times that of Carrington and Davidson, namely, $5\times10^{17} \exp(-11\ 000/RT)$ cubic centimeter per gram mole per second, was used as an average of the results of various investigators for the calculations herein.

TABLE V. - VALUES OF REACTION RATE PARAMETER φ FOR VARIOUS PRESSURES[a]

(a) $N_2O_4 \rightleftharpoons 2NO_2$

Temperature, T, °K	Pressure, P, atm				
	0.01	0.1	1	10	100
	Reaction rate parameter φ[a]				
300	0.365×10^{2}	0.820×10^{3}	1.29×10^{4}	1.36×10^{5}	0.853×10^{6}
320	.364	.766	1.52	1.86	1.24
340	.447	.710	1.55	2.32	1.71
360	.605	.745	1.45	2.62	2.23
380	.816	.890	1.37	2.69	2.74
400	----	1.123	1.41	2.60	3.15
500	----	-----	----	3.23	2.46
600	----	-----	----	----	3.08

(b) $2NO_2 \rightleftharpoons 2NO+O_2$

Temperature, T, °K	0.01	0.1	1	10	100
400	0.0219×10^{-2}	----------	---------	--------	--------
500	.213	0.273×10^{-1}	0.334×10^{0}	--------	--------
600	.497	.905	1.34	1.74×10^{1}	--------
700	.560	1.27	2.53	4.09	5.68×10^{2}
800	.635	1.36	3.03	6.05	9.97
900	.778	1.51	3.18	6.87	13.3
1000	.942	1.75	3.40	7.16	14.9
1100	1.108	2.01	3.75	7.47	15.6
1200	1.263	2.26	4.13	7.89	15.9

[a]Eq. (4), $\varphi \equiv \left[\left(\frac{\lambda_e}{\lambda_f \lambda_r}\right)\left(\frac{\Delta H}{RT}\right)^2 R\mathcal{R}\right]^{1/2}$, cm^{-1}.

At higher temperatures the predominant reaction is $2NO_2 \rightleftharpoons 2NO+O_2$. The rate of dissociation is second order and has been measured by Rosser and Wise (ref. 16) and confirmed by Ashmore and Burnett (ref. 17). Both are consistent with the recalculated work of Bodenstein cited in reference 17. The rate of decomposition of NO_2 is given by

$$-\frac{d[NO_2]}{dt} = 4\times10^{12} \exp\left(-\frac{26\ 900}{RT}\right) [NO_2]^2 \text{ g-mole/(cc)(sec)} \tag{B11}$$

Table V presents values of φ as calculated from equation (4) at various pressures. The lower temperature values are for the $N_2O_4 \rightleftharpoons 2NO_2$ reaction and the higher temperature values for the $2NO_2 \rightleftharpoons 2NO+O_2$ reaction. Although the reactions are simultaneous, the first reaction is a much faster reaction than the second. Therefore, in most cases the appropriate value of φ is that for the $N_2O_4 \rightleftharpoons 2NO_2$ reaction up to temperatures at which the N_2O_4 is completely dissociated. This was the criterion used in making table V.

APPENDIX C

APPLICATION OF THE CHEMICAL KINETIC PARAMETER φ TO CONVECTIVE HEAT TRANSFER

It is the purpose of this appendix to provide a specific example as to how the chemical kinetic parameter φ, defined in equation (4), may be useful in estimating heat transfer in convective flow where the chemistry is neither completely at equilibrium nor completely frozen.

Consider the Nusselt number formulated with the equilibrium thermal conductivity

$$Nu_e \equiv \frac{hd}{\lambda_e} = \left(\frac{hd}{\lambda^*}\right)\left(\frac{\lambda^*}{\lambda_e}\right) \tag{C1}$$

where h is the heat transfer coefficient, d is a characteristic dimension, and λ^* is the effective "thermal conductivity" of a boundary layer with small temperature differences. It might reasonably be assumed that a heat transfer correlation applicable in the absence of reaction should be appropriate, so that

$$\frac{hd}{\lambda^*} = A\ Re^n\ Pr^m \tag{C2}$$

(For example, if a turbulent pipe flow situation were being considered, $n = 0.8$ and $m \simeq 0.3$ to 0.4.) It may be argued that neither the frozen nor the equilibrium Prandtl number is appropriate for a reacting gas, but rather $Pr \equiv c_p^* \eta/\lambda^*$ should be used. However, as can be seen from table IV, the equilibrium and frozen Prandtl numbers for a given pressure and temperature are very nearly the same for almost all conditions. Furthermore, the exponent on the Prandtl number is less than one, further reducing the uncertainty in hd/λ^*. Thus, the choice of Prandtl numbers is not critical.

If thermal accommodation occurs on the surface, $F = 0$ in equation (B1) and

$$\frac{\lambda^*}{\lambda_e} = \frac{\lambda_f}{\lambda_f + G\lambda_r} \tag{C3}$$

so that

$$Nu_e = \frac{A\,Re^n\,Pr^m}{1 + G\left(\frac{\lambda_r}{\lambda_f}\right)} \tag{C4}$$

Let the boundary layer now be idealized as a stagnant film with heat transfer by conduction only. Then the equations for conduction between plane parallel plates can be applied. It will be assumed that one wall is fully catalytic and corresponds to the free stream or bulk flow, while the other wall is noncatalytic. In this event (ref. 27)

$$G = \frac{\tanh \varphi \ell}{\varphi \ell} \tag{C5}$$

where ℓ is the boundary layer thickness. On the assumption that the heat transfer does occur by conduction through a stagnant film

$$q = h\,\Delta T = \lambda^* \frac{\Delta T}{\ell} \tag{C6}$$

Equations (C2) and (C6) can be combined and solved for ℓ

$$\ell = \frac{d}{A\,Re^m\,Pr^n} \tag{C7}$$

Thus, the heat transfer coefficient may be obtained through equations (C4), (C5), and (C7). This should be a good approximation for subsonic flows where temperature differences are not too large.

APPENDIX D

INTERPOLATION OF REACTION THERMAL CONDUCTIVITY AND HEAT CAPACITY FOR INTERMEDIATE PRESSURES

From the compositions of table III it is apparent that to a good approximation the reactions $N_2O_4 \rightleftharpoons 2NO_2 \rightleftharpoons 2NO+O_2$ can be treated separately. Then for the first reaction, $N_2O_4 \rightleftharpoons 2NO_2$, the thermal conductivity and heat capacity due to chemical reaction are given by (refs. 22 and 23)

$$\lambda_r = \left(\frac{\Delta H^2}{RT^2}\right)\left(\frac{PD_{NO_2-N_2O_4}}{R'T}\right)\left[\frac{x_{N_2O_4}x_{NO_2}}{\left(1 + x_{N_2O_4}\right)^2}\right] \tag{D1}$$

$$c_{p_r} = \left(\frac{\Delta H^2}{RT^2}\right)\frac{1}{M_{NO_2}}\left[\frac{x_{N_2O_4}x_{NO_2}}{\left(1 + x_{N_2O_4}\right)^3}\right] \tag{D2}$$

At constant temperature, ΔH and $PD_{NO_2-N_2O_4}$ are pressure independent. Therefore, to interpolate for intermediate pressures only the compositions at one known pressure are needed. These can be obtained by solving the following pair of equations:

$$x_{NO_2} + x_{N_2O_4} = 1 \tag{D3}$$

$$\frac{x_{NO_2}^2 P}{x_{N_2O_4}} = K_p \tag{D4}$$

The equilibrium constant in equation (D4) may be calculated at each temperature from the results of table III.

Similar results can be obtained for the $2NO_2 \rightleftharpoons 2NO+O_2$ reaction but are considerably more complicated for λ_r. However, if it is assumed that all three binary diffusion coefficients are the same at each temperature, then

$$\lambda_r \propto \frac{x_{NO_2} x_{NO}}{\left(1 + 0.5 x_{NO_2}\right)^2} \tag{D5}$$

$$c_{p_r} \propto \frac{x_{NO_2} x_{NO}}{\left(1 + 0.5\, x_{NO_2}\right)^3} \tag{D6}$$

Similarly, the compositions can be obtained from the following equations:

$$x_{NO_2} + \frac{3}{2} x_{NO} = 1 \tag{D7}$$

$$\frac{x_{NO}^3 P}{x_{NO_2}^2} = 2K_p \tag{D8}$$

As an illustration consider the following: Find c_{p_r} at 600° K and 0.3 atmosphere for the equilibrium NO_2-N_2O_4-NO-O_2 system.

The solution to this can be found directly from table IV(b), inasmuch as data for 0.3 atmosphere are already tabulated. However, to illustrate the calculating procedure this value will be calculated from the data at 0.1 atmosphere. From equation (D8)

$$2K_p = \frac{x_{NO}^3 P}{x_{NO_2}^2} = \frac{(0.33028)^3 (0.1)}{(0.50457)^2} = 1.41515\times10^{-2} \tag{D9}$$

Combining equations (D7) and (D8) gives

$$\frac{x_{NO}^3}{\left(1 - \frac{3}{2} x_{NO}\right)^2} = \frac{2K_p}{P} \tag{D10}$$

To find the composition at 0.3 atmosphere and 600° K, the following is used:

$$\frac{x_{NO}^3}{\left(1 - \frac{3}{2} x_{NO}\right)^2} = \frac{1.41515 \times 10^{-2}}{0.3} = 0.047172 \tag{D11}$$

which is a cubic equation in x_{NO}. Equation (D11) may be solved rather easily by trial and error. For an initial guess, see table III(b). The mole fractions of NO at 0.1 and 1 atmosphere are 0.33028 and 0.19268, respectively. Thus, a first guess for x_{NO} at 0.3 atmosphere will be between these two, perhaps 0.25. By trial and error, it is found that $x_{NO} = 0.25992$, which agrees with that given in table III(b). From equation (D7), $x_{NO_2} = 1 - \frac{3}{2} x_{NO} = 0.61012$. The value of c_{p_r} at 0.1 atmosphere from table IV(b) is $1.3565 - 0.2424 = 1.1141$ cal/(g)($^{\circ}$K). Then applying equation (D6) at 0.1 and 0.3 atmosphere and 600° K, after taking ratios gives

$$\frac{c_{p_r}(0.3\ \text{atm})}{1.1141} = \frac{(0.25992)(0.61012)}{\left[1 + 0.5(0.61012)\right]^3} \frac{\left[1 + 0.5(0.50457)\right]^3}{(0.33028)(0.50457)} \tag{D12}$$

or $c_{p_r} = 0.9367$, which agrees with the value in table IV(b).

REFERENCES

1. Callaghan, Michael J.; and Mason, David M.: Momentum and Heat Transfer Correlations for a Reacting Gas in Turbulent Pipe Flow. A.I.Ch.E. J., vol. 10, no. 1, Jan. 1964, pp. 52-55.

2. Furgason, R.R.; and Smith, J.M.: Heat Transfer in the Nitrogen Dioxide-Nitrogen Tetroxide System. A.I.Ch.E. J., vol. 8, no. 5, Nov. 1962, pp. 654-658.

3. Irving, J.P.; and Smith, J.M.: Heat Transfer in a Chemically Reacting System (Nitrogen Tetroxide-Dioxide). A.I.Ch.E. J., vol. 7, no. 1, Mar. 1961, pp. 91-96.

4. Richardson, J.L.; Boynton, F.P.; Eng, K.Y.; and Mason, D.M.: Heat Transfer in Reacting Systems. Heat Transfer to N_2O_4 Gas Flowing Normal to a Heated Cylinder. Chem. Eng. Sci., vol. 13, 1961, pp. 130-142.

5. Schotte, William: Heat Transfer to a Gas-Phase Chemical Reaction. Ind. Eng. Chem., vol. 50, no. 4, Apr. 1958, pp. 683-690.

6. Brokaw, Richard S.: Correlation of Turbulent Heat Transfer in a Tube for the Dissociating System $N_2O_4 \rightleftharpoons 2NO_2$. NACA RM E57K19a, 1958.

7. Beal, John L.; and Lyerly, Ray L.: Influence of Gas Dissociation on Heat Transfer. WADC TR 56-494 (ASTIA No. AD 118074), Cornell Aeronautical Lab., Inc., Sept. 1956.

8. Fan, Stephen S.T.; and Mason, David M.: Properties of the System $N_2O_4 \rightleftharpoons 2NO_2 \rightleftharpoons 2NO+O_2$. J. Chem. Eng. Data, vol. 7, no. 2, Apr. 1962, pp. 183-186.

9. Petker, Ira; and Mason, David M.: Viscosity of the N_2O_4-NO_2 Gas System. J. Chem. Eng. Data, vol. 9, no. 2, Apr. 1964, pp. 280-281.

10. Beer, Hans; Wärmeübergang in dissoziierenden Gasen. Doctoral Thesis, Institut Für Thermodynamik der Flugtriebwerke, Technische Hochschule, Stuttgart, Germany, Mar. 1963.

11. Thievon, William J.; Sterbutzel, Gerald A.; and Beal, John L.: The Influence of Gas Dissociation on Heat Transfer. WADC TR 59-450, Cornell Aeronautical Lab., Inc., June 1959.

12. Coffin, Kenneth P.; and O'Neal, Cleveland, Jr.: Experimental Thermal Conductivities of the $N_2O_4 \rightleftharpoons 2NO_2$ System. NACA TN 4209, 1958.

13. Hirschfelder, Joseph O.; Curtiss, Charles F.; and Bird, R. Byron: Molecular Theory of Gases and Liquids. John Wiley & Sons, Inc., 1954.

14. Svehla, Roger A.: Estimated Viscosities and Thermal Conductivities of Gases at High Temperatures. NASA TR R-132, 1962.

15. Yost, Don M.; and Russell, Horace Jr.: Systematic Inorganic Chemistry. Prentice-Hall, Inc., 1946.

16. Rosser, Willis A. Jr.; and Wise, Henry: Thermal Decomposition of Nitrogen Dioxide. J. Chem. Phys., vol. 24, no. 2, Feb. 1956, pp. 493-494.

17. Ashmore, P.G.; and Burnett, M.G.: Concurrent Molecular and Free Radical Mechanisms in the Thermal Decomposition of Nitrogen Dioxide. Trans. Faraday Soc., vol. 58, 1962, pp. 253-261.

18. Gray, Peter; and Yoffe, A.D.: The Reactivity and Structure of Nitrogen Dioxide. Chem. Rev., vol. 55, 1955, pp. 1069-1154.

19. Reamer, H.H.; and Sage, B.H.: Volumetric Behavior of Nitrogen Dioxide in the Liquid Phase. Ind. Eng. Chem., vol. 44, no. 1, Jan. 1952, pp. 185-187.

20. Svehla, Roger A.: Thermodynamic and Transport Properties for the Hydrogen-Oxygen System. NASA SP-3011, 1964.

21. Brokaw, Richard S.; Svehla, Roger A.; and Baker, Charles E.: Transport Properties of Dilute Gas Mixtures. NASA TN D-2580, 1965.

22. Butler, James N.; and Brokaw, Richard S.: Thermal Conductivity of Gas Mixtures in Chemical Equilibrium. J. Chem. Phys., vol. 26, no. 6, June 1957, pp. 1636-1643.

23. Brokaw, Richard S.: Thermal Conductivity of Gas Mixtures in Chemical Equilibrium II. J. Chem. Phys., vol. 32, no. 4, Apr. 1960, pp. 1005-1006.

24. Zeleznik, Frank J.; and Gordon, Sanford: A General IBM 704 or 7090 Computer Program for Computation of Chemical Equilibrium Compositions, Rocket Performance, and Chapman-Jouguet Detonations. NASA TN D-1454, 1962.

25. Gordon, Sanford; and Zeleznik, Frank J.: A General IBM 704 or 7090 Computer Program for Computation of Chemical Equilibrium Compositions, Rocket Performance, and Chapman-Jouguet Detonations. Supplement 1 - Assigned Area-Ratio Performance. NASA TN D-1737, 1963.

26. McBride, Bonnie J.; Heimel, Sheldon; Ehlers, Janet G.; and Gordon, Sanford: Thermodynamic Properties to 6000° K for 210 Substances Involving the First 18 Elements. NASA SP-3001, 1963.

27. Brokaw, Richard S.: "Thermal Conductivity" and Chemical Kinetics. J. Chem. Phys., vol. 35, no. 5, Nov. 1961, pp. 1569-1580.

28. Kannuluik, W.G.; and Carman, E.H.: The Thermal Conductivity of Rare Gases. Proc. Phys. Soc. (London), vol. 65, sec. B, Sept. 1952, pp. 701-709.

29. Baker, Charles E.; and Brokaw, Richard S.: Thermal Conductivities of Gaseous H_2O, D_2O, and the Equimolar H_2O-D_2O Mixture. J. Chem. Phys., vol. 40, no. 6, Mar. 15, 1964, pp. 1523-1528.

30. Carrington, Tucker; and Davidson, Norman: Shock Waves in Chemical Kinetics: The Rate of Dissociation of N_2O_4. J. Phys. Chem., vol. 57, no. 4, Apr. 1953, pp. 418-427.

31. Cher, Mark: Rate of Dissociation of N_2O_4 by Ultrasonic Absorption Measurements. J. Chem. Phys., vol. 37, no. 11, Dec. 1, 1962, pp. 2564-2570.

32. Sessler, G.: Schallausbreitung in Teilweise dissoziiertem, gasförmigen Distickstofftetroxyd. Acustica, vol. 10, no. 1, 1960, pp. 44-59.

TABLE III. - THERMODYNAMIC PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

[P is pressure, T is temperature, H is enthalpy, S is entropy, (DLM/DLP)T ≡ $(\partial \ln M/\partial \ln P)_T$, (DLM/DLT)P ≡ $(\partial \ln M/\partial \ln T)_P$, CP is heat capacity at constant pressure, and GAMMA is isentropic exponent $(\partial \ln P/\partial \ln \rho)_S$ where ρ is density.]

(a) NO_2-N_2O_4 system

EQUILIBRIUM THERMODYNAMIC PROPERTIES

P, ATM	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
T, DEG K	300	320	340	360	380	400	420	440	460	480	500	520	540
H, CAL/G	159.3	174.2	181.1	185.9	190.3	194.5	198.8	203.1	207.5	211.9	216.4	221.0	225.6
S, CAL/(G)(K)	1.3986	1.4471	1.4579	1.4813	1.4935	1.5045	1.5149	1.5249	1.5347	1.5441	1.5533	1.5622	1.5709
M, MOL WT	48.477	46.648	46.193	46.069	46.030	46.017	46.012	46.010	46.009	46.009	46.008	46.008	46.008
(DLM/DLP)T	0.04575	0.01335	0.00397	0.00132	0.00049	0.00020	0.00009	0.00004	0.00002	0.00001	0.00001	0.00000	0.00000
(DLM/DLT)P	-1.0485	-0.2866	-0.0801	-0.0250	-0.0087	-0.0034	-0.0014	-0.0007	-0.0003	-0.0002	-0.0001	-0.0001	-0.0000
CP, CAL/(G)(K)	1.1792	0.4590	0.2598	0.2241	0.2138	0.2128	0.2147	0.2174	0.2203	0.2234	0.2264	0.2293	0.2322
GAMMA	1.1113	1.1632	1.2226	1.2514	1.2579	1.2564	1.2526	1.2483	1.2440	1.2398	1.2358	1.2321	1.2285
MOLE FRACTIONS													
N1O2(G)	0.94633	0.98608	0.99593	0.99868	0.99951	0.99980	0.99991	0.99996	0.99998	0.99999	0.99999	1.00000	1.00000
N2O4(G)	0.05367	0.01392	0.00402	0.00132	0.00049	0.00020	0.00009	0.00004	0.00002	0.00001	0.00001	0.00000	0.00000

EQUILIBRIUM THERMODYNAMIC PROPERTIES

P, ATM	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
T, DEG K	560	580	600	620	640	660	680	700	720	740	760	780
H, CAL/G	230.3	235.0	239.8	244.6	249.5	254.4	259.4	264.4	269.5	274.6	279.7	284.9
S, CAL/(G)(K)	1.5794	1.5877	1.5958	1.6037	1.6115	1.6191	1.6265	1.6338	1.6409	1.6479	1.6547	1.6614
M, MOL WT	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008
(DLM/DLP)T	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
(DLM/DLT)P	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000
CP, CAL/(G)(K)	0.2350	0.2377	0.2403	0.2428	0.2453	0.2476	0.2498	0.2519	0.2540	0.2559	0.2578	0.2595
GAMMA	1.2252	1.2221	1.2191	1.2164	1.2138	1.2113	1.2090	1.2069	1.2049	1.2031	1.2013	1.1997
MOLE FRACTIONS												
N1O2(G)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

EQUILIBRIUM THERMODYNAMIC PROPERTIES

P, ATM	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
T, DEG K	800	820	840	860	880	900	920	940	960	980	1000	1020	1040
H, CAL/G	290.1	295.3	300.5	305.9	311.2	316.6	322.0	327.4	332.8	338.3	343.7	349.2	354.7
S, CAL/(G)(K)	1.6680	1.6745	1.6809	1.6871	1.6932	1.6992	1.7051	1.7110	1.7167	1.7223	1.7278	1.7333	1.7386
M, MOL WT	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008
(DLM/DLP)T	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.
(DLM/DLT)P	-0.0000	-0.0000	-0.0000	-0.0000	0.0000	-0.0000	-0.0000	0.0000	-0.0000	-0.0000	-0.0000	-0.0000	0.0000
CP, CAL/(G)(K)	0.2612	0.2628	0.2643	0.2657	0.2671	0.2684	0.2697	0.2709	0.2720	0.2732	0.2743	0.2752	0.2761
GAMMA	1.1982	1.1967	1.1954	1.1941	1.1929	1.1918	1.1907	1.1897	1.1887	1.1878	1.1869	1.1862	1.1855
MOLE FRACTIONS													
N1O2(G)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

EQUILIBRIUM THERMODYNAMIC PROPERTIES

P, ATM	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
T, DEG K	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280
H, CAL/G	360.3	365.8	371.4	377.0	382.5	388.2	393.8	399.4	405.1	410.7	416.4	422.1
S, CAL/(G)(K)	1.7439	1.7491	1.7542	1.7592	1.7641	1.7690	1.7738	1.7786	1.7832	1.7878	1.7924	1.7969
M, MOL WT	46.009	46.008	46.008	46.009	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008
(DLM/DLP)T	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
(DLM/DLT)P	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CP, CAL/(G)(K)	0.2769	0.2777	0.2785	0.2793	0.2800	0.2808	0.2815	0.2822	0.2829	0.2836	0.2842	0.2849
GAMMA	1.1848	1.1842	1.1836	1.1830	1.1824	1.1818	1.1813	1.1807	1.1802	1.1797	1.1792	1.1787
MOLE FRACTIONS												
N1O2(G)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

TABLE III. - Continued. THERMODYNAMIC PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

[P is pressure, T is temperature, H is enthalpy, S is entropy, (DLM/DLP)T ≡ $(\partial \ln M/\partial \ln P)_T$, (DLM/DLT)P ≡ $(\partial \ln M/\partial \ln T)_P$, CP is heat capacity at constant pressure, and GAMMA is isentropic exponent $(\partial \ln P/\partial \ln \rho)_S$ where ρ is density.]

(a) Continued. NO_2-N_2O_4 system

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000
T, DEG K	300	320	340	360	380	400	420	440	460	480	500	520	540
H, CAL/G	106.5	148.3	171.5	182.5	189.0	194.0	198.6	203.0	207.4	211.9	216.4	221.0	225.6
S, CAL/(G)(K)	1.1359	1.2710	1.3419	1.3734	1.3909	1.4038	1.4149	1.4252	1.4351	1.4446	1.4538	1.4627	1.4715
M, MOL WT	59.651	51.194	47.736	46.602	46.230	46.099	46.049	46.028	46.018	46.013	46.011	46.010	46.009
(DLM/DLP)T	0.12409	0.08077	0.03358	0.01241	0.00476	0.00197	0.00088	0.00042	0.00022	0.00012	0.00007	0.00004	0.00003
(DLM/DLT)P	-2.8443	-1.7335	-0.6772	-0.2360	-0.0855	-0.0335	-0.0142	-0.0065	-0.0032	-0.0017	-0.0009	-0.0005	-0.0003
CP, CAL/(G)(K)	2.3688	1.6430	0.7696	0.3952	0.2732	0.2350	0.2236	0.2213	0.2222	0.2243	0.2268	0.2296	0.2324
GAMMA	1.0914	1.1059	1.1345	1.1798	1.2205	1.2406	1.2463	1.2457	1.2429	1.2393	1.2356	1.2320	1.2285
MOLE FRACTIONS													
N1O2(G)	0.70345	0.88728	0.96243	0.98710	0.99517	0.99802	0.99912	0.99958	0.99978	0.99988	0.99993	0.99996	0.99997
N2O4(G)	0.29655	0.11271	0.03757	0.01290	0.00483	0.00198	0.00088	0.00042	0.00022	0.00012	0.00007	0.00004	0.00003

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000
T, DEG K	560	580	600	620	640	660	680	700	720	740	760	780
H, CAL/G	230.3	235.0	239.8	244.6	249.5	254.4	259.4	264.4	269.5	274.6	279.7	284.9
S, CAL/(G)(K)	1.4800	1.4882	1.4964	1.5043	1.5120	1.5196	1.5270	1.5343	1.5414	1.5484	1.5553	1.5620
M, MOL WT	46.009	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008
(DLM/DLP)T	0.00002	0.00001	0.00001	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
(DLM/DLT)P	-0.0002	-0.0001	-0.0001	-0.0001	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000
CP, CAL/(G)(K)	0.2351	0.2378	0.2404	0.2429	0.2453	0.2476	0.2498	0.2519	0.2540	0.2559	0.2578	0.2595
GAMMA	1.2252	1.2220	1.2191	1.2163	1.2138	1.2113	1.2090	1.2069	1.2049	1.2031	1.2013	1.1997
MOLE FRACTIONS												
N1O2(G)	0.99998	0.99999	0.99999	0.99999	0.99999	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
N2O4(G)	0.00002	0.00001	0.00001	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000
T, DEG K	800	820	840	860	880	900	920	940	960	980	1000	1020	1040
H, CAL/G	290.1	295.3	300.6	305.9	311.2	316.6	322.0	327.4	332.8	338.3	343.7	349.2	354.7
S, CAL/(G)(K)	1.5686	1.5750	1.5814	1.5876	1.5938	1.5998	1.6057	1.6115	1.6172	1.6228	1.6284	1.6338	1.6392
M, MOL WT	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008
(DLM/DLP)T	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
(DLM/DLT)P	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000
CP, CAL/(G)(K)	0.2612	0.2628	0.2643	0.2657	0.2671	0.2684	0.2697	0.2709	0.2720	0.2732	0.2743	0.2752	0.2761
GAMMA	1.1982	1.1967	1.1954	1.1941	1.1929	1.1918	1.1907	1.1897	1.1887	1.1878	1.1869	1.1862	1.1855
MOLE FRACTIONS													
N1O2(G)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000
T, DEG K	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280
H, CAL/G	360.3	365.8	371.4	377.0	382.5	388.2	393.8	399.4	405.1	410.7	416.4	422.1
S, CAL/(G)(K)	1.6444	1.6496	1.6547	1.6597	1.6647	1.6696	1.6744	1.6791	1.6838	1.6884	1.6929	1.6974
M, MOL WT	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008
(DLM/DLP)T	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
(DLM/DLT)P	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	0.0000	-0.0000	-0.0000	-0.0000
CP, CAL/(G)(K)	0.2769	0.2777	0.2785	0.2793	0.2800	0.2808	0.2815	0.2822	0.2829	0.2836	0.2842	0.2849
GAMMA	1.1848	1.1842	1.1836	1.1830	1.1824	1.1818	1.1813	1.1807	1.1802	1.1797	1.1792	1.1787
MOLE FRACTIONS												
N1O2(G)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

TABLE III. - Continued. THERMODYNAMIC PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

[P is pressure, T is temperature, H is enthalpy, S is entropy, (DLM/DLP)T ≡ $(\partial \ln M/\partial \ln P)_T$, (DLM/DLT)P ≡ $(\partial \ln M/\partial \ln T)_P$, CP is heat capacity at constant pressure, and GAMMA is isentropic exponent $(\partial \ln P/\partial \ln \rho)_S$ where ρ is density.]

(a) Continued. NO_2-N_2O_4 system

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	1.000	1.000	1.000	1.000	1.000	1.0000	1.000	1.0000	1.0000	1.000	1.000	1.000	1.000
T, DEG K	300	320	340	360	380	400	420	440	460	480	500	520	540
H, CAL/G	55.6	87.2	125.6	158.0	177.8	189.1	196.3	201.9	206.9	211.6	216.2	220.9	225.5
S, CAL/(G)(K)	0.8992	1.0009	1.1174	1.2101	1.2539	1.2927	1.3104	1.3234	1.3345	1.3445	1.3540	1.3631	1.3719
M, MOL WT	76.672	66.411	56.886	50.879	48.356	46.888	46.408	46.202	46.108	46.062	46.039	46.027	46.020
(DLM/DLP)T	0.08003	0.11845	0.11809	0.07741	0.03898	0.01806	0.00847	0.00416	0.00215	0.00118	0.00067	0.00040	0.00025
(DLM/DLT)P	-1.8344	-2.5420	-2.3813	-1.4712	-0.7003	-0.3075	-0.1369	-0.0640	-0.0316	-0.0165	-0.0090	-0.0052	-0.0031
CP, CAL/(G)(K)	1.2895	1.8358	1.8827	1.2988	0.7288	0.4329	0.3088	0.2595	0.2402	0.2333	0.2316	0.2322	0.2338
GAMMA	1.0887	1.0941	1.1038	1.1189	1.1429	1.1755	1.2059	1.2247	1.2327	1.2344	1.2332	1.2307	1.2278
MOLE FRACTIONS													
N1O2(G)	0.33349	0.55654	0.76356	0.89413	0.95549	0.98088	0.99131	0.99579	0.99783	0.99882	0.99932	0.99960	0.99975
N2O4(G)	0.66650	0.44346	0.23644	0.10587	0.04451	0.01912	0.00869	0.00421	0.00217	0.00118	0.00068	0.00040	0.00025

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
T, DEG K	560	580	600	620	640	660	680	700	720	740	760	780
H, CAL/G	230.2	235.0	239.8	244.6	249.5	254.4	259.4	264.4	269.5	274.6	279.7	284.9
S, CAL/(G)(K)	1.3804	1.3887	1.3969	1.4048	1.4125	1.4201	1.4276	1.4348	1.4420	1.4490	1.4558	1.4625
M, MOL WT	46.015	46.013	46.011	46.010	46.010	46.009	46.009	46.009	46.008	46.008	46.008	46.008
(DLM/DLP)T	0.00016	0.00011	0.00007	0.00005	0.00004	0.00003	0.00002	0.00002	0.00001	0.00001	0.00001	0.00001
(DLM/DLT)P	-0.0019	-0.0012	-0.0008	-0.0005	-0.0004	-0.0003	-0.0002	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001
CP, CAL/(G)(K)	0.2360	0.2383	0.2407	0.2431	0.2454	0.2477	0.2499	0.2520	0.2540	0.2559	0.2578	0.2595
GAMMA	1.2248	1.2218	1.2190	1.2163	1.2137	1.2113	1.2090	1.2069	1.2049	1.2031	1.2013	1.1997
MOLE FRACTIONS												
N1O2(G)	0.99984	0.99989	0.99992	0.99995	0.99996	0.99997	0.99998	0.99998	0.99999	0.99999	0.99999	0.99999
N2O4(G)	0.00016	0.00011	0.00007	0.00005	0.00004	0.00003	0.00002	0.00002	0.00001	0.00001	0.00001	0.00001

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	1.000	1.0000	1.000	1.000	1.000	1.000	1.000	1.000	1.0000	1.000	1.000	1.000	1.000
T, DEG K	800	820	840	860	880	900	920	940	960	980	1000	1020	1040
H, CAL/G	290.1	295.3	300.6	305.9	311.2	316.6	322.0	327.4	332.8	338.3	343.7	349.2	354.7
S, CAL/(G)(K)	1.4691	1.4756	1.4819	1.4882	1.4943	1.5003	1.5062	1.5120	1.5178	1.5234	1.5289	1.5343	1.5397
M, MOL WT	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008
(DLM/DLP)T	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
(DLM/DLT)P	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000
CP, CAL/(G)(K)	0.2612	0.2628	0.2643	0.2657	0.2671	0.2684	0.2697	0.2709	0.2720	0.2732	0.2743	0.2752	0.2761
GAMMA	1.1981	1.1967	1.1954	1.1941	1.1929	1.1918	1.1907	1.1897	1.1887	1.1878	1.1869	1.1862	1.1855
MOLE FRACTIONS													
N1O2(G)	0.99999	0.99999	1.00000	0.99999	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
N2O4(G)	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	1.000	1.000	1.000	1.000	1.000	1.0000	1.000	1.000	1.000	1.000	1.000	1.000
T, DEG K	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280
H, CAL/G	360.3	365.8	371.4	376.9	382.5	388.2	393.8	399.4	405.1	410.7	416.4	422.1
S, CAL/(G)(K)	1.5450	1.5502	1.5553	1.5603	1.5652	1.5701	1.5749	1.5796	1.5843	1.5889	1.5935	1.5979
M, MOL WT	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008
(DLM/DLP)T	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
(DLM/DLT)P	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000
CP, CAL/(G)(K)	0.2769	0.2777	0.2785	0.2793	0.2800	0.2808	0.2815	0.2822	0.2829	0.2836	0.2842	0.2849
GAMMA	1.1848	1.1842	1.1836	1.1830	1.1824	1.1818	1.1813	1.1807	1.1802	1.1797	1.1792	1.1787
MOLE FRACTIONS												
N1O2(G)	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

TABLE III. - Continued. THERMODYNAMIC PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

[P is pressure, T is temperature, H is enthalpy, S is entropy, (DLM/DLP)T ≡ $(\partial \ln M/\partial \ln P)_T$, (DLM/DLT)P ≡ $(\partial \ln M/\partial \ln T)_P$, CP is heat capacity at constant pressure, and GAMMA is isentropic exponent $(\partial \ln P/\partial \ln \rho)_S$ where ρ is density.]

(a) Continued. NO_2-N_2O_4 system

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
T, DEG K	300	320	340	360	380	400	420	440	460	480	500	520	540
H, CAL/G	35.5	49.4	69.9	97.4	123.8	157.3	178.2	192.1	201.5	208.6	214.5	219.8	224.9
S, CAL/(G)(K)	0.7764	0.8213	0.8832	0.9618	1.0467	1.1198	1.1709	1.2032	1.2242	1.2393	1.2514	1.2618	1.2713
M, MOL WT	86.444	81.358	74.145	65.796	58.157	52.690	49.486	47.812	46.968	46.540	46.315	46.192	46.123
(DLM/DLP)T	0.03015	0.05692	0.09145	0.11985	0.12162	0.09465	0.06040	0.03488	0.01961	0.01116	0.00654	0.00396	0.00248
(DLM/DLT)P	-0.6911	-1.2215	-1.8441	-2.2779	-2.1850	-1.6113	-0.9766	-0.5367	-0.2877	-0.1564	-0.0876	-0.0509	-0.0306
CP, CAL/(G)(K)	0.5650	0.8465	1.2070	1.5207	1.5558	1.2499	0.8508	0.5619	0.3597	0.3174	0.2771	0.2576	0.2486
GAMMA	1.0943	1.0935	1.0967	1.1032	1.1126	1.1250	1.1416	1.1625	1.1847	1.2030	1.2146	1.2202	1.2219
MOLE FRACTIONS													
N1O2(G)	0.12110	0.23166	0.38835	0.56990	0.73595	0.85477	0.92441	0.96080	0.97912	0.98844	0.99333	0.99599	0.99750
N2O4(G)	0.87890	0.76834	0.61164	0.43010	0.26405	0.14523	0.07559	0.03920	0.02088	0.01156	0.00667	0.00401	0.00250

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	10.00	10.00	10.00	10.00	10.00	10.000	10.00	10.000	10.000	10.00	10.00	10.000
T, DEG K	560	580	600	620	640	660	680	700	720	740	760	780
H, CAL/G	229.8	234.7	239.6	244.5	249.4	254.3	259.3	264.4	269.4	274.5	279.7	284.9
S, CAL/(G)(K)	1.2803	1.2889	1.2971	1.3051	1.3130	1.3206	1.3280	1.3353	1.3425	1.3495	1.3563	1.3631
M, MOL WT	46.082	46.057	46.042	46.032	46.025	46.021	46.017	46.015	46.014	46.012	46.011	46.011
(DLM/DLP)T	0.00161	0.00107	0.00074	0.00052	0.00037	0.00027	0.00021	0.00016	0.00012	0.00010	0.00008	0.00006
(DLM/DLT)P	-0.0190	-0.0122	-0.0081	-0.0055	-0.0038	-0.0027	-0.0020	-0.0014	-0.0011	-0.0008	-0.0006	-0.0005
CP, CAL/(G)(K)	0.2448	0.2438	0.2442	0.2454	0.2470	0.2487	0.2506	0.2525	0.2544	0.2562	0.2580	0.2597
GAMMA	1.2215	1.2199	1.2179	1.2156	1.2133	1.2110	1.2089	1.2068	1.2048	1.2030	1.2013	1.1996
MOLE FRACTIONS												
N1O2(G)	0.99838	0.99892	0.99926	0.99948	0.99963	0.99972	0.99979	0.99984	0.99988	0.99990	0.99992	0.99994
N2O4(G)	0.00161	0.00108	0.00074	0.00052	0.00037	0.00027	0.00021	0.00016	0.00012	0.00010	0.00008	0.00006

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.000
T, DEG K	800	820	840	860	880	900	920	940	960	980	1000	1020	1040
H, CAL/G	290.1	295.3	300.6	305.9	311.2	316.6	322.0	327.4	332.8	338.3	343.7	349.2	354.7
S, CAL/(G)(K)	1.3696	1.3761	1.3825	1.3887	1.3948	1.4009	1.4068	1.4126	1.4183	1.4239	1.4294	1.4349	1.4402
M, MOL WT	46.010	46.010	46.010	46.009	46.009	46.009	46.009	46.009	46.009	46.008	46.008	46.008	46.008
(DLM/DLP)T	0.00005	0.00004	0.00003	0.00003	0.00002	0.00002	0.00002	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001
(DLM/DLT)P	-0.0004	-0.0003	-0.0003	-0.0002	-0.0002	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0000
CP, CAL/(G)(K)	0.2613	0.2629	0.2644	0.2658	0.2671	0.2684	0.2697	0.2709	0.2721	0.2732	0.2744	0.2752	0.2761
GAMMA	1.1981	1.1967	1.1954	1.1941	1.1929	1.1918	1.1907	1.1897	1.1887	1.1878	1.1869	1.1862	1.1855
MOLE FRACTIONS													
N1O2(G)	0.99995	0.99996	0.99996	0.99997	0.99997	0.99998	0.99998	0.99998	0.99999	0.99998	0.99999	0.99999	0.99999
N2O4(G)	0.00005	0.00004	0.00003	0.00003	0.00002	0.00002	0.00002	0.00002	0.00001	0.00001	0.00001	0.00001	0.00001

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
T, DEG K	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280
H, CAL/G	360.3	365.8	371.4	376.9	382.5	388.1	393.8	399.4	405.1	410.7	416.4	422.1
S, CAL/(G)(K)	1.4455	1.4507	1.4558	1.4608	1.4658	1.4706	1.4755	1.4802	1.4849	1.4895	1.4940	1.4985
M, MOL WT	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008	46.008
(DLM/DLP)T	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
(DLM/DLT)P	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000	-0.0000
CP, CAL/(G)(K)	0.2769	0.2777	0.2785	0.2793	0.2800	0.2808	0.2815	0.2822	0.2829	0.2836	0.2842	0.2849
GAMMA	1.1848	1.1842	1.1836	1.1830	1.1824	1.1818	1.1813	1.1807	1.1802	1.1797	1.1792	1.1787
MOLE FRACTIONS												
N1O2(G)	0.99999	0.99999	0.99999	0.99999	0.99999	0.99999	0.99999	0.99999	0.99999	1.00000	1.00000	1.00000
N2O4(G)	0.00001	0.00001	0.00001	0.00001	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

TABLE III. - Continued. THERMODYNAMIC PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

[P is pressure, T is temperature, H is enthalpy, S is entropy, (DLM/DLP)T ≡ $(\partial \ln M/\partial \ln P)_T$, (DLM/DLT)P ≡ $(\partial \ln M/\partial \ln T)_P$, CP is heat capacity at constant pressure, and GAMMA is isentropic exponent $(\partial \ln P/\partial \ln \rho)_S$ where ρ is density.]

(a) Concluded. NO_2-N_2O_4 system

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
T, DEG K	300	320	340	360	380	400	420	440	460	480	500	520	540
H, CAL/G	28.9	36.2	45.8	58.6	75.5	96.7	121.0	145.9	168.3	186.4	200.1	210.6	218.9
S, CAL/(G)(K)	0.7029	0.7263	0.7554	0.7921	0.8377	0.8918	0.9512	1.0091	1.0589	1.0974	1.1255	1.1460	1.1617
M, MOL WT	90.174	88.328	85.336	80.991	75.370	68.965	62.621	57.198	53.155	50.450	48.757	47.730	47.110
(DLM/DLP)T	0.01000	0.02000	0.03607	0.05880	0.08504	0.11126	0.12453	0.11909	0.09830	0.07254	0.05003	0.03348	0.02229
(DLM/DLT)P	-0.2292	-0.4293	-0.7274	-1.1175	-1.5458	-1.8941	-2.0135	-1.8324	-1.4422	-1.0165	-0.6706	-0.4299	-0.2746
CP, CAL/(G)(K)	0.3170	0.4144	0.5541	0.7383	0.9530	1.1526	1.2580	1.2055	1.0176	0.7887	0.5956	0.4611	0.3762
GAMMA	1.1050	1.1000	1.0981	1.0992	1.1029	1.1088	1.1167	1.1263	1.1374	1.1501	1.1641	1.1781	1.1903
MOLE FRACTIONS													
N1O2(G)	0.04002	0.08015	0.14518	0.23962	0.36181	0.50103	0.63890	0.75678	0.84465	0.90346	0.94024	0.96256	0.97606
N2O4(G)	0.95998	0.91984	0.85482	0.76038	0.63819	0.49897	0.36110	0.24322	0.15535	0.09654	0.05976	0.03744	0.02394

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
T, DEG K	560	580	600	620	640	660	680	700	720	740	760	780
H, CAL/G	225.9	232.0	237.7	243.2	248.5	253.7	258.8	264.0	269.1	274.3	279.5	284.7
S, CAL/(G)(K)	1.1744	1.1852	1.1949	1.2038	1.2122	1.2202	1.2279	1.2354	1.2426	1.2497	1.2567	1.2634
M, MOL WT	46.730	46.494	46.343	45.244	46.179	46.134	46.102	46.080	46.064	46.052	46.043	46.036
(DLM/DLP)T	0.01498	0.01023	0.00712	0.00505	0.00367	0.00271	0.00204	0.00156	0.00121	0.00095	0.00076	0.00052
(DLM/DLT)P	-0.1772	-0.1164	-0.0780	-0.0534	-0.0373	-0.0265	-0.0193	-0.0143	-0.0107	-0.0082	-0.0063	-0.0050
CP, CAL/(G)(K)	0.3250	0.2949	0.2774	0.2674	0.2518	0.2590	0.2579	0.2577	0.2582	0.2590	0.2601	0.2613
GAMMA	1.1995	1.2054	1.2085	1.2095	1.2095	1.2085	1.2072	1.2057	1.2041	1.2025	1.2009	1.1994
MOLE FRACTIONS												
N1O2(G)	0.98430	0.98944	0.99272	0.99486	0.99629	0.99727	0.99795	0.99843	0.99879	0.99904	0.99924	0.99938
N2O4(G)	0.01570	0.01056	0.00728	0.00514	0.00371	0.00273	0.00205	0.00156	0.00121	0.00096	0.00075	0.00052

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
T, DEG K	800	820	840	860	880	900	920	940	960	980	1000	1020	1040
H, CAL/G	290.0	295.2	300.5	305.8	311.2	316.5	321.9	327.3	332.8	338.2	343.7	349.2	354.7
S, CAL/(G)(K)	1.2701	1.2766	1.2829	1.2892	1.2953	1.3013	1.3073	1.3131	1.3188	1.3244	1.3300	1.3354	1.3408
M, MOL WT	46.031	46.027	46.024	46.021	46.019	46.018	46.016	46.015	46.014	46.014	46.013	46.012	46.012
(DLM/DLP)T	0.00050	0.00042	0.00035	0.00029	0.00025	0.00021	0.00018	0.00016	0.00014	0.00012	0.00011	0.00010	0.00009
(DLM/DLT)P	-0.0039	-0.0032	-0.0026	-0.0321	-0.0017	-0.0014	-0.0012	-0.0010	-0.0009	-0.0008	-0.0006	-0.0006	-0.0005
CP, CAL/(G)(K)	0.2625	0.2638	0.2651	0.2664	0.2676	0.2688	0.2700	0.2712	0.2723	0.2734	0.2745	0.2754	0.2762
GAMMA	1.1979	1.1966	1.1953	1.1940	1.1929	1.1917	1.1907	1.1897	1.1887	1.1878	1.1868	1.1861	1.1855
MOLE FRACTIONS													
N1O2(G)	0.99949	0.99958	0.99965	0.99971	0.99975	0.99979	0.99982	0.99984	0.99986	0.99988	0.99989	0.99990	0.99991
N2O4(G)	0.00050	0.00042	0.00035	0.00029	0.00025	0.00021	0.00018	0.00016	0.00014	0.00012	0.00011	0.00010	0.00009

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
T, DEG K	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280
H, CAL/G	360.2	365.8	371.4	376.9	382.5	388.1	393.8	399.4	405.1	410.7	416.4	422.1
S, CAL/(G)(K)	1.3460	1.3512	1.3563	1.3614	1.3563	1.3712	1.3760	1.3807	1.3854	1.3900	1.3945	1.3990
M, MOL WT	46.012	46.011	46.011	46.011	46.010	46.010	46.010	46.010	46.010	46.010	46.009	46.009
(DLM/DLP)T	0.00008	0.00007	0.00006	0.00006	0.00005	0.00005	0.00004	0.00004	0.00004	0.00004	0.00003	0.00003
(DLM/DLT)P	-0.0004	-0.0004	-0.0003	-0.0003	-0.0003	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002	-0.0001	-0.0001
CP, CAL/(G)(K)	0.2770	0.2778	0.2786	0.2793	0.2801	0.2808	0.2815	0.2822	0.2829	0.2836	0.2842	0.2849
GAMMA	1.1848	1.1842	1.1836	1.1830	1.1824	1.1818	1.1813	1.1807	1.1802	1.1797	1.1792	1.1787
MOLE FRACTIONS												
N1O2(G)	0.99992	0.99993	0.99994	0.99994	0.99995	0.99995	0.99995	0.99996	0.99996	0.99996	0.99996	0.99997
N2O4(G)	0.00008	0.00007	0.00006	0.00006	0.00005	0.00005	0.00004	0.00004	0.00004	0.00004	0.00003	0.00003

TABLE III. - Continued. THERMODYNAMIC PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

[P is pressure, T is temperature, H is enthalpy, S is entropy, (DLM/DLP)T ≡ $(\partial \ln M/\partial \ln P)_T$, (DLM/DLT)P ≡ $(\partial \ln M/\partial \ln T)_P$, CP is heat capacity at constant pressure, and GAMMA is isentropic exponent $(\partial \ln P/\partial \ln \rho)_S$ where ρ is density.]

(b) NO_2-N_2O_4-NO-O_2 system

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
T, DEG K	300	320	340	360	380	400	420	440	460	480	500	520	540
H, CAL/G	159.4	174.6	182.0	187.9	194.1	201.5	210.8	222.7	237.8	256.7	279.8	306.7	336.7
S, CAL/(G)(K)	1.3992	1.4484	1.4709	1.4875	1.5044	1.5235	1.5461	1.5737	1.6072	1.6475	1.6945	1.7473	1.8040
M, MOL WT	48.462	46.615	46.120	45.917	45.736	45.484	45.106	44.555	43.796	42.813	41.620	40.266	38.834
(DLM/DLP)T	0.04581	0.01355	0.00447	0.00239	0.00259	0.00400	0.00651	0.01021	0.01516	0.02118	0.02774	0.03398	0.03883
(DLM/DLT)P	-1.0524	-0.2959	-0.1009	-0.0566	-0.0854	-0.1350	-0.2132	-0.3212	-0.4572	-0.6129	-0.7715	-0.9094	-1.0015
CP, CAL/(G)(K)	1.1871	0.4767	0.3064	0.2934	0.3352	0.4122	0.5231	0.6691	0.8476	1.0488	1.2536	1.4338	1.5575
GAMMA	1.1107	1.1583	1.1990	1.1982	1.1766	1.1528	1.1331	1.1187	1.1093	1.1037	1.1011	1.1007	1.1023
MOLE FRACTIONS													
N1O1(G)	0.00050	0.00133	0.00310	0.00655	0.01275	0.02313	0.03937	0.06325	0.09621	0.13892	0.19078	0.24960	0.31188
N1O2(G)	0.94566	0.98414	0.99136	0.98383	0.98040	0.96512	0.94086	0.90510	0.85567	0.79161	0.71383	0.62559	0.53218
N2O4(G)	0.05359	0.01387	0.00399	0.00129	0.00047	0.00019	0.00008	0.00003	0.00002	0.00001	0.00000	0.00000	0.00000
O2(G)	0.00025	0.00067	0.00155	0.00328	0.00638	0.01156	0.01969	0.03162	0.04810	0.06946	0.09539	0.12480	0.15594

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
T, DEG K	560	580	600	620	640	660	680	700	720	740	760	780
H, CAL/G	368.5	400.1	430.1	457.2	480.8	501.0	518.0	532.3	544.6	555.2	564.5	572.9
S, CAL/(G)(K)	1.8617	1.9173	1.9581	2.0125	2.0500	2.0810	2.1064	2.1272	2.1445	2.1590	2.1715	2.1824
M, MOL WT	37.418	36.107	34.962	34.010	33.247	32.653	32.199	31.854	31.593	31.395	31.245	31.130
(DLM/DLP)T	0.04139	0.04128	0.03877	0.03462	0.02973	0.02482	0.02033	0.01648	0.01330	0.01072	0.00866	0.00703
(DLM/DLT)P	-1.0300	-0.9922	-0.9012	-0.7791	-0.6482	-0.5248	-0.4174	-0.3287	-0.2578	-0.2022	-0.1591	-0.1258
CP, CAL/(G)(K)	1.5999	1.5540	1.4343	1.2701	1.0923	0.9245	0.7794	0.6609	0.5677	0.4960	0.4416	0.4006
GAMMA	1.1055	1.1102	1.1167	1.1249	1.1350	1.1471	1.1611	1.1767	1.1933	1.2103	1.2268	1.2422
MOLE FRACTIONS												
N1O1(G)	0.37343	0.43042	0.48019	0.52158	0.55472	0.58053	0.60030	0.61530	0.62665	0.63524	0.64176	0.64676
N1O2(G)	0.43986	0.35437	0.27971	0.21763	0.16793	0.12920	0.09954	0.07704	0.06003	0.04715	0.03735	0.02986
O2(G)	0.18671	0.21521	0.24010	0.26079	0.27736	0.29027	0.30015	0.30765	0.31332	0.31762	0.32088	0.32338

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
T, DEG K	800	820	840	860	880	900	920	940	960	980	1000	1020	1040
H, CAL/G	580.6	587.8	594.5	601.0	607.2	613.2	619.1	625.0	630.7	636.4	642.0	647.6	653.2
S, CAL/(G)(K)	2.1921	2.2010	2.2091	2.2167	2.2238	2.2306	2.2371	2.2434	2.2494	2.2553	2.2609	2.2665	2.2719
M, MOL WT	31.041	30.973	30.919	30.876	30.843	30.816	30.794	30.776	30.761	30.749	30.739	30.730	30.723
(DLM/DLP)T	0.00574	0.00471	0.00390	0.00325	0.00272	0.00230	0.00195	0.00167	0.00143	0.00124	0.00108	0.00094	0.00083
(DLM/DLT)P	-0.1001	-0.0802	-0.0647	-0.0526	-0.0431	-0.0355	-0.0295	-0.0247	-0.0208	-0.0176	-0.0150	-0.0128	-0.0111
CP, CAL/(G)(K)	0.3698	0.3466	0.3292	0.3160	0.3061	0.2985	0.2928	0.2884	0.2851	0.2825	0.2806	0.2791	0.2780
GAMMA	1.2559	1.2678	1.2778	1.2860	1.2925	1.2976	1.3016	1.3045	1.3067	1.3083	1.3093	1.3101	1.3106
MOLE FRACTIONS													
N1O1(G)	0.65060	0.65359	0.65593	0.65778	0.65925	0.66043	0.66138	0.66216	0.66280	0.66333	0.66377	0.66413	0.66444
N1O2(G)	0.02409	0.01961	0.01610	0.01333	0.01113	0.00936	0.00793	0.00676	0.00580	0.00501	0.00435	0.00380	0.00334
O2(G)	0.32530	0.32680	0.32797	0.32889	0.32962	0.33021	0.33069	0.33108	0.33140	0.33166	0.33188	0.33207	0.33222

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100	0.0100
T, DEG K	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280
H, CAL/G	658.7	664.3	669.8	675.3	680.8	686.3	691.9	697.4	702.9	708.4	714.0	719.5
S, CAL/(G)(K)	2.2772	2.2824	2.2874	2.2924	2.2973	2.3021	2.3068	2.3115	2.3160	2.3205	2.3249	2.3293
M, MOL WT	30.717	30.712	30.708	30.704	30.701	30.698	30.695	30.693	30.691	30.690	30.688	30.687
(DLM/DLP)T	0.00073	0.00065	0.00058	0.00052	0.00046	0.00042	0.00038	0.00034	0.00031	0.00029	0.00026	0.00024
(DLM/DLT)P	-0.0096	-0.0083	-0.0073	-0.0054	-0.0056	-0.0050	-0.0044	-0.0040	-0.0035	-0.0032	-0.0029	-0.0026
CP, CAL/(G)(K)	0.2772	0.2767	0.2763	0.2761	0.2760	0.2760	0.2761	0.2762	0.2764	0.2767	0.2769	0.2772
GAMMA	1.3108	1.3109	1.3107	1.3105	1.3101	1.3097	1.3093	1.3087	1.3082	1.3076	1.3070	1.3064
MOLE FRACTIONS												
N1O1(G)	0.66470	0.66493	0.66512	0.66528	0.66542	0.66555	0.66566	0.66575	0.66583	0.66590	0.66597	0.66603
N1O2(G)	0.00294	0.00261	0.00232	0.00208	0.00186	0.00168	0.00152	0.00138	0.00125	0.00114	0.00105	0.00096
O2(G)	0.33235	0.33246	0.33256	0.33264	0.33271	0.33277	0.33283	0.33287	0.33292	0.33295	0.33298	0.33301

TABLE III. - Continued. THERMODYNAMIC PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

[P is pressure, T is temperature, H is enthalpy, S is entropy, (DLM/DLP)T ≡ $(\partial \ln M/\partial \ln P)_T$, (DLM/DLT)P ≡ $(\partial \ln M/\partial \ln T)_P$, CP is heat capacity at constant pressure, and GAMMA is isentropic exponent $(\partial \ln P/\partial \ln \rho)_s$ where ρ is density.]

(b) Continued. NO_2-N_2O_4-NO-O_2 system

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300
T, DEG K	300	320	340	360	380	400	420	440	460	480	500	520	540
H, CAL/G	139.3	167.3	179.4	186.5	192.6	199.3	207.1	216.8	228.9	243.8	262.1	283.9	308.9
S, CAL/(G)(K)	1.2883	1.3791	1.4161	1.4364	1.4530	1.4699	1.4891	1.5116	1.5383	1.5701	1.6074	1.6501	1.6974
M, MOL WT	52.189	47.805	46.502	46.082	45.869	45.663	45.383	44.984	44.427	43.688	42.758	41.652	40.412
(DLM/DLP)T	0.09055	0.03532	0.01179	0.00463	0.00291	0.00325	0.00479	0.00740	0.01109	0.01586	0.02150	0.02758	0.03338
(DLM/DLT)P	-2.0774	-0.7619	-0.2454	-0.1028	-0.0794	-0.1023	-0.1539	-0.2312	-0.3338	-0.4586	-0.5979	-0.7380	-0.8609
CP, CAL/(G)(K)	2.0109	0.8835	0.4248	0.3123	0.3118	0.3570	0.4333	0.5384	0.6713	0.8284	1.0010	1.1740	1.3267
GAMMA	1.0974	1.1245	1.1685	1.1952	1.1891	1.1694	1.1491	1.1325	1.1204	1.1123	1.1075	1.1052	1.1049
MOLE FRACTIONS													
N1O1(G)	0.00033	0.00091	0.00214	0.00454	0.00887	0.01615	0.02764	0.04474	0.06882	0.10089	0.14129	0.18935	0.24329
N1O2(G)	0.86499	0.95913	0.98499	0.98930	0.98527	0.97521	0.95830	0.93278	0.89671	0.84863	0.78805	0.71596	0.63507
N2O4(G)	0.13452	0.03951	0.01180	0.00389	0.00142	0.00057	0.00024	0.00011	0.00005	0.00003	0.00001	0.00001	0.00000
O2(G)	0.00016	0.00045	0.00107	0.00227	0.00444	0.00807	0.01382	0.02237	0.03441	0.05045	0.07065	0.09468	0.12164

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300
T, DEG K	560	580	600	620	640	660	680	700	720	740	760	780
H, CAL/G	336.6	366.0	395.6	424.2	450.7	474.5	495.3	513.3	528.8	542.2	553.8	564.1
S, CAL/(G)(K)	1.7478	1.7992	1.8494	1.8963	1.9384	1.9750	2.0061	2.0322	2.0540	2.0724	2.0879	2.1013
M, MOL WT	39.099	37.790	36.554	35.446	34.495	33.706	33.070	32.566	32.171	31.864	31.626	31.441
(DLM/DLP)T	0.03809	0.04096	0.04162	0.04013	0.03699	0.03285	0.02837	0.02401	0.02005	0.01661	0.01372	0.01133
(DLM/DLT)P	-0.9478	-0.9847	-0.9674	-0.9031	-0.8065	-0.6948	-0.5823	-0.4787	-0.3886	-0.3133	-0.2519	-0.2026
CP, CAL/(G)(K)	1.4365	1.4852	1.4656	1.3846	1.2603	1.1152	0.9688	0.8345	0.7187	0.6232	0.5465	0.4861
GAMMA	1.1064	1.1093	1.1135	1.1192	1.1264	1.1351	1.1454	1.1573	1.1705	1.1848	1.1997	1.2147
MOLE FRACTIONS												
N1O1(G)	0.30033	0.35725	0.41095	0.45913	0.50049	0.53477	0.56243	0.58434	0.60149	0.61483	0.62519	0.63326
N1O2(G)	0.54950	0.46413	0.38357	0.31131	0.24927	0.19785	0.15636	0.12350	0.09777	0.07776	0.06221	0.05011
O2(G)	0.15017	0.17862	0.20548	0.22955	0.25024	0.26738	0.28121	0.29217	0.30074	0.30742	0.31260	0.31663

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300
T, DEG K	800	820	840	860	880	900	920	940	960	980	1000	1020	1040
H, CAL/G	573.4	581.8	589.5	596.8	603.7	610.3	616.6	622.8	628.8	634.7	640.6	646.4	652.1
S, CAL/(G)(K)	2.1130	2.1234	2.1327	2.1413	2.1492	2.1566	2.1636	2.1702	2.1765	2.1827	2.1886	2.1943	2.1998
M, MOL WT	31.296	31.182	31.092	31.021	30.964	30.918	30.881	30.850	30.825	30.804	30.787	30.773	30.760
(DLM/DLP)T	0.00937	0.00778	0.00649	0.00544	0.00458	0.00388	0.00331	0.00284	0.00245	0.00212	0.00185	0.00162	0.00142
(DLM/DLT)P	-0.1634	-0.1323	-0.1077	-0.0881	-0.0726	-0.0601	-0.0501	-0.0420	-0.0355	-0.0301	-0.0257	-0.0220	-0.0190
CP, CAL/(G)(K)	0.4391	0.4026	0.3745	0.3527	0.3359	0.3229	0.3128	0.3049	0.2988	0.2940	0.2902	0.2872	0.2849
GAMMA	1.2291	1.2425	1.2546	1.2652	1.2742	1.2818	1.2879	1.2929	1.2969	1.2999	1.3023	1.3042	1.3056
MOLE FRACTIONS													
N1O1(G)	0.63955	0.64449	0.64839	0.65149	0.65397	0.65597	0.65759	0.65892	0.66001	0.66091	0.66167	0.66230	0.66283
N1O2(G)	0.04067	0.03326	0.02741	0.02276	0.01904	0.01604	0.01361	0.01162	0.00999	0.00863	0.00750	0.00655	0.00576
O2(G)	0.31978	0.32225	0.32420	0.32575	0.32699	0.32799	0.32880	0.32946	0.33000	0.33046	0.33083	0.33115	0.33141

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300	0.0300
T, DEG K	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280
H, CAL/G	657.8	663.4	669.0	674.6	680.2	685.8	691.4	696.9	702.5	708.1	713.6	719.2
S, CAL/(G)(K)	2.2052	2.2105	2.2157	2.2207	2.2257	2.2305	2.2353	2.2400	2.2446	2.2491	2.2535	2.2579
M, MOL WT	30.750	30.741	30.734	30.727	30.721	30.716	30.712	30.708	30.705	30.702	30.700	30.697
(DLM/DLP)T	0.00126	0.00112	0.00100	0.00089	0.00080	0.00072	0.00065	0.00059	0.00054	0.00049	0.00045	0.00041
(DLM/DLT)P	-0.0165	-0.0143	-0.0125	-0.0110	-0.0097	-0.0086	-0.0076	-0.0068	-0.0061	-0.0055	-0.0049	-0.0045
CP, CAL/(G)(K)	0.2831	0.2817	0.2806	0.2798	0.2792	0.2788	0.2785	0.2784	0.2783	0.2783	0.2784	0.2785
GAMMA	1.3065	1.3072	1.3076	1.3078	1.3079	1.3078	1.3076	1.3073	1.3069	1.3065	1.3061	1.3055
MOLE FRACTIONS												
N1O1(G)	0.66328	0.66366	0.66399	0.66427	0.66452	0.66473	0.66492	0.66508	0.66522	0.66535	0.66546	0.66556
N1O2(G)	0.00508	0.00451	0.00401	0.00359	0.00322	0.00290	0.00262	0.00238	0.00217	0.00198	0.00181	0.00166
O2(G)	0.33164	0.33183	0.33200	0.33214	0.33226	0.33237	0.33246	0.33254	0.33261	0.33267	0.33273	0.33278

TABLE III. - Continued. THERMODYNAMIC PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

[P is pressure, T is temperature, H is enthalpy, S is entropy, (DLM/DLP)T ≡ $(\partial \ln M/\partial \ln P)_T$, (DLM/DLT)P ≡ $(\partial \ln M/\partial \ln T)_P$, CP is heat capacity at constant pressure, and GAMMA is isentropic exponent $(\partial \ln P/\partial \ln \rho)_S$ where ρ is density.]

(b) Continued. NO_2-N_2O_4-NO-O_2 system

EQUILIBRIUM THERMODYNAMIC PROPERTIES

P, ATM	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000
T, DEG K	300	320	340	360	380	400	420	440	460	480	500	520	540
H, CAL/G	106.5	148.4	172.0	183.5	193.8	197.3	204.2	212.3	221.9	233.7	247.9	264.9	284.7
S, CAL/(G)(K)	1.1362	1.2717	1.3433	1.3762	1.3960	1.4127	1.4296	1.4483	1.4697	1.4947	1.5237	1.5570	1.5944
M, MOL WT	59.641	51.173	47.697	46.527	46.090	45.846	45.617	45.326	44.931	44.403	43.721	42.880	41.892
(DLM/DLP)T	0.12416	0.08086	0.03377	0.01287	0.00571	0.00374	0.00394	0.00539	0.00787	0.01132	0.01569	0.02081	0.02634
(DLM/DLT)P	-2.8471	-1.7383	-0.6866	-0.2550	-0.1211	-0.0955	-0.1157	-0.1635	-0.2343	-0.3261	-0.4355	-0.5565	-0.6791
CP, CAL/(G)(K)	2.3729	1.6518	0.7867	0.4274	0.3299	0.3287	0.3701	0.4390	0.5316	0.6458	0.7778	0.9210	1.0648
GAMMA	1.0913	1.1055	1.1323	1.1589	1.1885	1.1828	1.1663	1.1492	1.1349	1.1243	1.1170	1.1125	1.1102

MOLE FRACTIONS

N1O1(G)	0.00019	0.00058	0.00141	0.00303	0.00594	0.01086	0.01867	0.03040	0.04717	0.06998	0.09953	0.13603	0.17897
N1O2(G)	0.70330	0.88660	0.96047	0.98257	0.98634	0.98180	0.97117	0.95401	0.92905	0.89494	0.85065	0.79593	0.73154
N2O4(G)	0.29642	0.11254	0.03741	0.01279	0.00474	0.00192	0.00083	0.00039	0.00019	0.00009	0.00005	0.00003	0.00001
O2(G)	0.00010	0.00029	0.00070	0.00151	0.00297	0.00543	0.00933	0.01520	0.02359	0.03499	0.04977	0.06802	0.08948

EQUILIBRIUM THERMODYNAMIC PROPERTIES

P, ATM	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000
T, DEG K	560	580	600	620	640	660	680	700	720	740	760	780
H, CAL/G	307.4	332.3	359.0	386.3	413.3	439.1	463.0	484.6	503.8	520.8	535.7	548.8
S, CAL/(G)(K)	1.6356	1.6794	1.7245	1.7693	1.8122	1.8519	1.8876	1.9189	1.9460	1.9693	1.9891	2.0062
M, MOL WT	40.785	39.607	38.410	37.252	36.178	35.221	34.395	33.701	33.130	32.667	32.294	31.996
(DLM/DLP)T	0.03176	0.03647	0.03985	0.04152	0.04135	0.03956	0.03655	0.03282	0.02884	0.02494	0.02133	0.01812
(DLM/DLT)P	-0.7903	-0.8765	-0.9264	-0.9343	-0.9017	-0.8365	-0.7502	-0.6545	-0.5591	-0.4704	-0.3916	-0.3241
CP, CAL/(G)(K)	1.1952	1.2970	1.3565	1.3663	1.3268	1.2468	1.1402	1.0216	0.9036	0.7944	0.6985	0.6173
GAMMA	1.1098	1.1108	1.1132	1.1168	1.1215	1.1275	1.1347	1.1431	1.1528	1.1636	1.1755	1.1881

MOLE FRACTIONS

N1O1(G)	0.22704	0.27828	0.33028	0.38064	0.42731	0.46893	0.50483	0.53499	0.55981	0.57996	0.59616	0.60912
N1O2(G)	0.65943	0.58257	0.50457	0.42904	0.35903	0.29661	0.24276	0.19752	0.16028	0.13006	0.10576	0.08631
N2O4(G)	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.	0.
O2(G)	0.11352	0.13914	0.16514	0.19032	0.21366	0.23446	0.25241	0.26749	0.27991	0.28998	0.29808	0.30456

EQUILIBRIUM THERMODYNAMIC PROPERTIES

P, ATM	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000
T, DEG K	800	820	840	860	880	900	920	940	960	980	1000	1020	1040
H, CAL/G	560.5	570.9	580.4	589.1	597.1	604.7	611.8	618.7	625.3	631.6	637.9	644.0	650.0
S, CAL/(G)(K)	2.0210	2.0338	2.0452	2.0555	2.0647	2.0732	2.0811	2.0884	2.0954	2.1019	2.1082	2.1143	2.1201
M, MOL WT	31.758	31.567	31.415	31.292	31.193	31.113	31.047	30.993	30.948	30.911	30.880	30.854	30.832
(DLM/DLP)T	0.01534	0.01297	0.01098	0.00932	0.00793	0.00678	0.00582	0.00502	0.00434	0.00378	0.00330	0.00290	0.00256
(DLM/DLT)P	-0.2675	-0.2207	-0.1823	-0.1511	-0.1256	-0.1049	-0.0881	-0.0743	-0.0629	-0.0536	-0.0459	-0.0395	-0.0341
CP, CAL/(G)(K)	0.5502	0.4956	0.4518	0.4168	0.3890	0.3669	0.3494	0.3354	0.3243	0.3154	0.3083	0.3026	0.2979
GAMMA	1.2010	1.2140	1.2266	1.2384	1.2493	1.2590	1.2676	1.2749	1.2810	1.2862	1.2904	1.2939	1.2967

MOLE FRACTIONS

N1O1(G)	0.61947	0.62775	0.63438	0.63971	0.64402	0.64751	0.65037	0.65272	0.65466	0.65627	0.65762	0.65875	0.65971
N1O2(G)	0.07079	0.05838	0.04844	0.04044	0.03398	0.02873	0.02444	0.02092	0.01801	0.01559	0.01357	0.01187	0.01044
O2(G)	0.30974	0.31387	0.31719	0.31985	0.32201	0.32376	0.32519	0.32636	0.32733	0.32814	0.32881	0.32938	0.32985

EQUILIBRIUM THERMODYNAMIC PROPERTIES

P, ATM	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000	0.1000
T, DEG K	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280
H, CAL/G	655.9	661.8	667.6	673.3	679.0	684.7	690.4	696.1	701.7	707.4	713.0	718.6
S, CAL/(G)(K)	2.1258	2.1312	2.1365	2.1417	2.1468	2.1518	2.1566	2.1614	2.1660	2.1706	2.1751	2.1795
M, MOL WT	30.813	30.797	30.784	30.772	30.762	30.753	30.745	30.738	30.733	30.727	30.723	30.718
(DLM/DLP)T	0.00226	0.00201	0.00180	0.00161	0.00145	0.00131	0.00118	0.00107	0.00098	0.00089	0.00082	0.00075
(DLM/DLT)P	-0.0296	-0.0258	-0.0226	-0.0199	-0.0176	-0.0156	-0.0139	-0.0124	-0.0111	-0.0100	-0.0090	-0.0081
CP, CAL/(G)(K)	0.2942	0.2912	0.2888	0.2869	0.2854	0.2842	0.2833	0.2825	0.2820	0.2816	0.2813	0.2811
GAMMA	1.2989	1.3007	1.3020	1.3030	1.3037	1.3041	1.3044	1.3045	1.3045	1.3044	1.3043	1.3040

MOLE FRACTIONS

N1O1(G)	0.66052	0.66121	0.66181	0.66232	0.66276	0.66315	0.66348	0.66378	0.66404	0.66426	0.66447	0.66465
N1O2(G)	0.00922	0.00818	0.00729	0.00652	0.00586	0.00528	0.00477	0.00433	0.00395	0.00360	0.00330	0.00303
O2(G)	0.33026	0.33061	0.33090	0.33116	0.33138	0.33157	0.33174	0.33189	0.33202	0.33213	0.33223	0.33232

TABLE III. - Continued. THERMODYNAMIC PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

[P is pressure, T is temperature, H is enthalpy, S is entropy, (DLM/DLP)T ≡ $(\partial \ln M/\partial \ln P)_T$, (DLM/DLT)P ≡ $(\partial \ln M/\partial \ln T)_P$, CP is heat capacity at constant pressure, and GAMMA is isentropic exponent $(\partial \ln P/\partial \ln \rho)_s$ where ρ is density.]

(b) Continued. NO_2-N_2O_4-NO-O_2 system

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000
T, DEG K	300	320	340	360	380	400	420	440	460	480	500	520	540
H, CAL/G	77.8	120.1	155.9	176.4	187.5	195.1	202.0	209.2	217.4	227.1	238.6	252.2	268.1
S, CAL/(G)(K)	1.0062	1.1425	1.2515	1.3102	1.3403	1.3598	1.3765	1.3933	1.4116	1.4322	1.4556	1.4822	1.5122
M, MOL WT	68.183	57.257	50.521	47.545	46.560	46.100	45.826	45.573	45.272	44.881	44.376	43.742	42.975
(DLM/DLP)T	0.11371	0.11942	0.07389	0.03330	0.01424	0.00699	0.00473	0.00474	0.00606	0.00838	0.01159	0.01561	0.02028
(DLM/DLT)P	-2.6072	-2.5651	-1.4943	-0.6406	-0.2692	-0.1415	-0.1130	-0.1297	-0.1734	-0.2378	-0.3199	-0.4165	-0.5223
CP, CAL/(G)(K)	1.9411	2.1142	1.3939	0.7241	0.4341	0.3477	0.3453	0.3823	0.4442	0.5257	0.6242	0.7360	0.8560
GAMMA	1.0889	1.0980	1.1132	1.1386	1.1684	1.1828	1.1776	1.1639	1.1494	1.1372	1.1279	1.1214	1.1172
MOLE FRACTIONS													
N1O1(G)	0.00011	0.00036	0.00094	0.00207	0.00410	0.00753	0.01300	0.02127	0.03319	0.04961	0.07128	0.09869	0.13194
N1O2(G)	0.51780	0.75477	0.90004	0.96327	0.97981	0.98294	0.97796	0.96690	0.94963	0.92528	0.89292	0.85188	0.80204
N2O4(G)	0.48203	0.24469	0.09856	0.03663	0.01404	0.00576	0.00254	0.00119	0.00059	0.00030	0.00016	0.00009	0.00005
O2(G)	0.00005	0.00018	0.00047	0.00103	0.00205	0.00377	0.00650	0.01064	0.01659	0.02481	0.03564	0.04934	0.06597

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000
T, DEG K	560	580	600	620	640	660	680	700	720	740	760	780
H, CAL/G	286.4	307.1	329.8	354.0	379.1	404.4	429.1	452.5	474.3	494.2	512.1	528.2
S, CAL/(G)(K)	1.5455	1.5817	1.6202	1.6600	1.6999	1.7387	1.7755	1.8095	1.8402	1.8674	1.8914	1.9123
M, MOL WT	42.084	41.091	40.029	38.939	37.864	36.843	35.905	35.069	34.343	33.724	33.206	32.776
(DLM/DLP)T	0.02533	0.03037	0.03493	0.03855	0.04086	0.04167	0.04101	0.03911	0.03631	0.03297	0.02942	0.02592
(DLM/DLT)P	-0.6298	-0.7297	-0.8119	-0.8674	-0.8909	-0.8812	-0.8418	-0.7799	-0.7039	-0.6218	-0.5402	-0.4636
CP, CAL/(G)(K)	0.9763	1.0874	1.1787	1.2404	1.2660	1.2536	1.2068	1.1333	1.0431	0.9459	0.8498	0.7602
GAMMA	1.1150	1.1145	1.1152	1.1172	1.1203	1.1243	1.1294	1.1355	1.1425	1.1506	1.1596	1.1695
MOLE FRACTIONS												
N1O1(G)	0.17062	0.21377	0.25992	0.30730	0.35403	0.39843	0.43920	0.47553	0.50710	0.53399	0.55652	0.57521
N1O2(G)	0.74405	0.67934	0.61011	0.53905	0.46895	0.40235	0.34120	0.28670	0.23934	0.19902	0.16521	0.13719
N2O4(G)	0.00003	0.00001	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
O2(G)	0.08531	0.10688	0.12996	0.15365	0.17701	0.19921	0.21960	0.23777	0.25355	0.26699	0.27826	0.28760

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	C.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000
T, DEG K	800	820	840	860	880	900	920	940	960	980	1000	1020	1040
H, CAL/G	542.6	555.5	567.1	577.6	587.3	596.2	604.5	612.3	619.7	626.8	633.6	640.3	646.7
S, CAL/(G)(K)	1.9305	1.9464	1.9604	1.9728	1.9839	1.9939	2.0030	2.0114	2.0192	2.0266	2.0335	2.0400	2.0463
M, MOL WT	32.422	32.133	31.896	31.702	31.543	31.412	31.305	31.215	31.141	31.079	31.027	30.983	30.946
(DLM/DLP)T	0.02262	0.01963	0.01697	0.01466	0.01266	0.01095	0.00949	0.00825	0.00719	0.00629	0.00553	0.00487	0.00431
(DLM/DLT)P	-0.3945	-0.3339	-0.2818	-0.2376	-0.2005	-0.1695	-0.1436	-0.1222	-0.1043	-0.0893	-0.0768	-0.0564	-0.0576
CP, CAL/(G)(K)	0.6801	0.6107	0.5519	0.5029	0.4625	0.4293	0.4022	0.3802	0.3623	0.3477	0.3358	0.3260	0.3180
GAMMA	1.1801	1.1912	1.2026	1.2140	1.2250	1.2355	1.2452	1.2541	1.2620	1.2689	1.2749	1.2802	1.2846
MOLE FRACTIONS													
N1O1(G)	0.59058	0.60318	0.61348	0.62191	0.62881	0.63449	0.63917	0.64305	0.64627	0.64896	0.65122	0.65313	0.65475
N1O2(G)	0.11413	0.09524	0.07978	0.06714	0.05678	0.04827	0.04124	0.03543	0.03060	0.02656	0.02316	0.02030	0.01788
O2(G)	0.29529	0.30159	0.30674	0.31095	0.31441	0.31724	0.31959	0.32152	0.32313	0.32448	0.32561	0.32657	0.32737

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	C.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000	0.3000
T, DEG K	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280
H, CAL/G	653.0	659.2	665.2	671.2	677.2	683.0	688.9	694.7	700.4	706.2	711.9	717.6
S, CAL/(G)(K)	2.0522	2.0580	2.0636	2.0690	2.0742	2.0794	2.0843	2.0892	2.0940	2.0987	2.1032	2.1077
M, MOL WT	30.914	30.887	30.864	30.844	30.827	30.811	30.798	30.787	30.776	30.767	30.759	30.752
(DLM/DLP)T	0.00383	0.00341	0.00305	0.00274	0.00247	0.00223	0.00202	0.00184	0.00168	0.00153	0.00141	0.00129
(DLM/DLT)P	-0.0501	-0.0438	-0.0385	-0.0339	-0.0300	-0.0266	-0.0237	-0.0212	-0.0190	-0.0171	-0.0154	-0.0139
CP, CAL/(G)(K)	0.3115	0.3061	0.3017	0.2981	0.2952	0.2927	0.2907	0.2891	0.2878	0.2867	0.2859	0.2852
GAMMA	1.2883	1.2913	1.2938	1.2958	1.2974	1.2987	1.2996	1.3004	1.3009	1.3012	1.3014	1.3015
MOLE FRACTIONS												
N1O1(G)	0.65613	0.65730	0.65832	0.65919	0.65995	0.66061	0.66118	0.66169	0.66213	0.66252	0.66287	0.66318
N1O2(G)	0.01581	0.01404	0.01253	0.01121	0.01008	0.00909	0.00823	0.00747	0.00680	0.00622	0.00569	0.00523
O2(G)	0.32806	0.32865	0.32916	0.32960	0.32997	0.33030	0.33059	0.33084	0.33107	0.33126	0.33144	0.33159

TABLE III. - Continued. THERMODYNAMIC PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

[P is pressure, T is temperature, H is enthalpy, S is entropy, (DLM/DLP)T ≡ $(\partial \ln M/\partial \ln P)_T$, (DLM/DLT)P ≡ $(\partial \ln M/\partial \ln T)_P$, CP is heat capacity at constant pressure, and GAMMA is isentropic exponent $(\partial \ln P/\partial \ln \rho)_S$ where ρ is density.]

(b) Continued. NO_2-N_2O_4-NO-O_2 system

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	1.000	1.000	1.0000	1.0000	1.0000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.0000
T, DEG K	300	320	340	360	380	400	420	440	460	480	500	520	540
H, CAL/G	55.6	87.2	125.8	158.4	178.7	190.6	198.9	206.2	213.7	221.9	231.3	242.2	254.7
S, CAL/(G)(K)	0.8993	1.0010	1.1180	1.2114	1.2663	1.2969	1.3172	1.3342	1.3508	1.3683	1.3874	1.4087	1.4324
M, MOL WT	76.668	66.398	56.859	50.831	47.978	46.760	46.197	45.864	45.585	45.280	44.910	44.450	43.887
(DLM/DLP)T	0.08007	0.11855	0.11824	0.07760	0.03934	0.01879	0.00982	0.00645	0.00579	0.00665	0.00856	0.01133	0.01483
(DLM/DLT)P	-1.8356	-2.5454	-2.3876	-1.4809	-0.7167	-0.3359	-0.1841	-0.1382	-0.1428	-0.1762	-0.2295	-0.2985	-0.3797
CP, CAL/(G)(K)	1.2907	1.8396	1.8917	1.3147	0.7555	0.4766	0.3774	0.3622	0.3878	0.4373	0.5040	0.5843	0.6750
GAMMA	1.0886	1.0940	1.1035	1.1179	1.1393	1.1632	1.1765	1.1745	1.1642	1.1523	1.1417	1.1334	1.1272
MOLE FRACTIONS													
N1O1(G)	0.00005	0.00020	0.00056	0.00132	0.00269	0.00501	0.00871	0.01431	0.02245	0.03376	0.04889	0.06838	0.09259
N1O2(G)	0.33348	0.55643	0.76304	0.89253	0.95179	0.97364	0.97847	0.97450	0.96431	0.94830	0.92608	0.89710	0.86092
N2O4(G)	0.66644	0.44328	0.23612	0.10549	0.04417	0.01884	0.00847	0.00403	0.00202	0.00106	0.00058	0.00033	0.00019
O2(G)	0.00003	0.00010	0.00028	0.00066	0.00135	0.00251	0.00435	0.00716	0.01122	0.01688	0.02445	0.03419	0.04630

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	1.0000	1.0000	1.000	1.000	1.0000	1.000	1.0000	1.000	1.000	1.0000	1.0000	1.000
T, DEG K	560	580	600	620	640	660	680	700	720	740	760	780
H, CAL/G	269.2	285.6	304.0	324.1	345.7	368.3	391.4	414.6	437.1	458.7	479.0	497.9
S, CAL/(G)(K)	1.4587	1.4875	1.5187	1.5516	1.5859	1.6207	1.6552	1.6887	1.7205	1.7501	1.7772	1.8016
M, MOL WT	43.215	42.441	41.577	40.646	39.676	38.698	37.742	36.836	35.999	35.243	34.576	33.995
(DLM/DLP)T	0.01892	0.02341	0.02801	0.03241	0.03624	0.03919	0.04104	0.04167	0.04115	0.03962	0.03733	0.03454
(DLM/DLT)P	-0.4693	-0.5617	-0.6506	-0.7289	-0.7900	-0.8287	-0.8423	-0.8309	-0.7977	-0.7473	-0.6855	-0.6179
CP, CAL/(G)(K)	0.7721	0.8705	0.9640	1.0457	1.1089	1.1482	1.1605	1.1459	1.1072	1.0498	0.9799	0.9038
GAMMA	1.1232	1.1208	1.1199	1.1203	1.1217	1.1241	1.1273	1.1314	1.1363	1.1420	1.1485	1.1558
MOLE FRACTIONS												
N1O1(G)	0.12161	0.15518	0.19268	0.23312	0.27528	0.31780	0.35933	0.39873	0.43512	0.46795	0.49697	0.52222
N1O2(G)	0.81747	0.76716	0.71095	0.65029	0.58706	0.52330	0.46100	0.40190	0.34732	0.29808	0.25454	0.21667
N2O4(G)	0.00011	0.00006	0.00004	0.00002	0.00001	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
O2(G)	0.06081	0.07759	0.09634	0.11656	0.13764	0.15890	0.17967	0.19937	0.21756	0.23397	0.24849	0.26111

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.0000	1.000	1.000
T, DEG K	800	820	840	860	880	900	920	940	960	980	1000	1020	1040
H, CAL/G	515.2	531.0	545.3	558.4	570.4	581.4	591.5	600.9	609.7	617.9	625.8	633.3	640.5
S, CAL/(G)(K)	1.8236	1.8431	1.8604	1.8758	1.8895	1.9019	1.9130	1.9231	1.9323	1.9409	1.9488	1.9562	1.9632
M, MOL WT	33.496	33.072	32.714	32.413	32.161	31.949	31.772	31.623	31.498	31.392	31.303	31.227	31.162
(DLM/DLP)T	0.03149	0.02839	0.02537	0.02253	0.01993	0.01759	0.01552	0.01368	0.01208	0.01068	0.00947	0.00841	0.00749
(DLM/DLT)P	-0.5492	-0.4829	-0.4211	-0.3652	-0.3157	-0.2723	-0.2348	-0.2026	-0.1751	-0.1516	-0.1316	-0.1145	-0.1000
CP, CAL/(G)(K)	0.8270	0.7533	0.6855	0.6248	0.5716	0.5258	0.4868	0.4538	0.4262	0.4030	0.3837	0.3675	0.3540
GAMMA	1.1637	1.1723	1.1815	1.1910	1.2007	1.2105	1.2201	1.2294	1.2382	1.2463	1.2538	1.2606	1.2667
MOLE FRACTIONS													
N1O1(G)	0.54389	0.56232	0.57789	0.59097	0.60194	0.61113	0.61884	0.62531	0.63076	0.63536	0.63925	0.64255	0.64537
N1O2(G)	0.18416	0.15651	0.13317	0.11355	0.09709	0.08330	0.07174	0.06203	0.05386	0.04697	0.04113	0.03617	0.03194
O2(G)	0.27195	0.28116	0.28894	0.29548	0.30097	0.30557	0.30942	0.31266	0.31538	0.31768	0.31962	0.32128	0.32269

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	1.0000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
T, DEG K	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280
H, CAL/G	647.5	654.2	660.8	667.3	673.6	679.8	685.9	692.0	698.0	704.0	709.9	715.7
S, CAL/(G)(K)	1.9699	1.9762	1.9822	1.9880	1.9936	1.9990	2.0043	2.0094	2.0143	2.0192	2.0239	2.0285
M, MOL WT	31.106	31.059	31.017	30.982	30.951	30.924	30.900	30.879	30.861	30.845	30.830	30.818
(DLM/DLP)T	0.00669	0.00599	0.00538	0.00485	0.00438	0.00397	0.00361	0.00329	0.00300	0.00275	0.00253	0.00233
(DLM/DLT)P	-0.0876	-0.0770	-0.0678	-0.0600	-0.0532	-0.0474	-0.0423	-0.0379	-0.0340	-0.0307	-0.0277	-0.0251
CP, CAL/(G)(K)	0.3427	0.3333	0.3254	0.3188	0.3133	0.3087	0.3048	0.3015	0.2988	0.2965	0.2946	0.2930
GAMMA	1.2720	1.2766	1.2806	1.2841	1.2869	1.2894	1.2914	1.2930	1.2944	1.2954	1.2963	1.2969
MOLE FRACTIONS												
N1O1(G)	0.64779	0.64986	0.65165	0.65320	0.65455	0.65572	0.65675	0.65766	0.65845	0.65916	0.65978	0.66034
N1O2(G)	0.02832	0.02521	0.02252	0.02020	0.01818	0.01641	0.01487	0.01351	0.01232	0.01126	0.01032	0.00949
O2(G)	0.32389	0.32493	0.32583	0.32660	0.32727	0.32786	0.32838	0.32883	0.32923	0.32958	0.32989	0.33017

TABLE III. - Continued. THERMODYNAMIC PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

[P is pressure, T is temperature, H is enthalpy, S is entropy, (DLM/DLP)T ≡ $(\partial \ln M/\partial \ln P)_T$, (DLM/DLT)P ≡ $(\partial \ln M/\partial \ln T)_P$, CP is heat capacity at constant pressure, and GAMMA is isentropic exponent $(\partial \ln P/\partial \ln \rho)_S$ where ρ is density.]

(b) Continued. NO_2-N_2O_4-NO-O_2 system

EQUILIBRIUM THERMODYNAMIC PROPERTIES

P, ATM	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000
T, DEG K	300	320	340	360	380	400	420	440	460	480	500	520	540
H, CAL/G	43.3	64.8	95.4	130.6	160.7	180.7	193.5	202.6	210.4	218.1	226.4	235.6	246.0
S, CAL/(G)(K)	0.8307	0.9000	0.9927	1.0933	1.1746	1.2262	1.2573	1.2785	1.2959	1.3123	1.3292	1.3472	1.3668
M, MOL WT	82.367	74.527	65.107	56.708	51.217	48.364	47.010	46.335	45.931	45.615	45.300	44.942	44.515
(DLM/DLP)T	0.05172	0.08982	0.12135	0.11784	0.08197	0.04602	0.02423	0.01347	0.00878	0.00727	0.00754	0.00899	0.01130
(DLM/DLT)P	-1.1856	-1.9284	-2.4491	-2.2444	-1.4805	-0.7958	-0.4105	-0.2354	-0.1702	-0.1609	-0.1830	-0.2255	-0.2828
CP, CAL/(G)(K)	0.8562	1.3092	1.7175	1.7093	1.2521	0.7848	0.5200	0.4099	0.3818	0.3958	0.4339	0.4879	0.5534
GAMMA	1.0904	1.0927	1.0990	1.1086	1.1220	1.1400	1.1594	1.1713	1.1715	1.1642	1.1547	1.1456	1.1382

MOLE FRACTIONS

N1O1(G)	0.00003	0.00010	0.00033	0.00082	0.00178	0.00340	0.00599	0.00991	0.01563	0.02362	0.03440	0.04844	0.06614
N1O2(G)	0.20966	0.37991	0.58423	0.76579	0.88324	0.94199	0.96624	0.97306	0.97041	0.96129	0.94659	0.92630	0.90018
N2O4(G)	0.79030	0.61993	0.41528	0.23298	0.11410	0.05291	0.02478	0.01206	0.00615	0.00328	0.00182	0.00104	0.00061
O2(G)	0.00001	0.00005	0.00016	0.00041	0.00089	0.00170	0.00299	0.00496	0.00781	0.01181	0.01720	0.02422	0.03307

EQUILIBRIUM THERMODYNAMIC PROPERTIES

P, ATM	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000
T, DEG K	560	580	600	620	640	660	680	700	720	740	760	780
H, CAL/G	257.8	271.1	286.1	302.6	320.6	340.0	360.4	381.4	402.8	424.0	444.8	464.9
S, CAL/(G)(K)	1.3883	1.4117	1.4370	1.4641	1.4927	1.5225	1.5529	1.5834	1.6135	1.6426	1.6704	1.6964
M, MOL WT	44.006	43.410	42.729	41.972	41.153	40.291	39.409	38.531	37.678	36.868	36.115	35.429
(DLM/DLP)T	0.01432	0.01789	0.02186	0.02602	0.03014	0.03393	0.03716	0.03960	0.04112	0.04167	0.04129	0.04010
(DLM/DLT)P	-0.3512	-0.4270	-0.5063	-0.5845	-0.6564	-0.7171	-0.7625	-0.7896	-0.7972	-0.7860	-0.7582	-0.7173
CP, CAL/(G)(K)	0.6274	0.7066	0.7874	0.8656	0.9366	0.9958	1.0392	1.0639	1.0687	1.0542	1.0227	0.9776
GAMMA	1.1326	1.1287	1.1263	1.1252	1.1253	1.1263	1.1281	1.1308	1.1341	1.1382	1.1429	1.1482

MOLE FRACTIONS

N1O1(G)	0.08776	0.11337	0.14280	0.17562	0.21118	0.24859	0.28689	0.32506	0.36215	0.39735	0.43006	0.45990
N1O2(G)	0.86799	0.82972	0.78567	0.73648	0.68318	0.62708	0.56964	0.51240	0.45677	0.40397	0.35491	0.31015
N2O4(G)	0.00037	0.00022	0.00014	0.00008	0.00005	0.00003	0.00002	0.00001	0.00001	0.00000	0.00000	0.00000
O2(G)	0.04388	0.05669	0.07140	0.08781	0.10559	0.12430	0.14345	0.16253	0.18107	0.19867	0.21503	0.22995

EQUILIBRIUM THERMODYNAMIC PROPERTIES

P, ATM	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000
T, DEG K	800	820	840	860	880	900	920	940	960	980	1000	1020	1040
H, CAL/G	483.9	501.8	518.4	533.8	548.1	561.3	573.4	584.7	595.2	605.0	614.2	622.9	631.2
S, CAL/(G)(K)	1.7205	1.7425	1.7626	1.7808	1.7971	1.8119	1.8253	1.8374	1.8485	1.8586	1.8679	1.8766	1.8846
M, MOL WT	34.813	34.267	33.789	33.374	33.016	32.708	32.444	32.219	32.025	31.860	31.719	31.597	31.492
(DLM/DLP)T	0.03825	0.03595	0.03336	0.03065	0.02794	0.02531	0.02284	0.02054	0.01845	0.01656	0.01486	0.01335	0.01201
(DLM/DLT)P	-0.6671	-0.6114	-0.5538	-0.4968	-0.4424	-0.3918	-0.3457	-0.3042	-0.2674	-0.2350	-0.2066	-0.1819	-0.1603
CP, CAL/(G)(K)	0.9231	0.8633	0.8019	0.7417	0.6848	0.6324	0.5853	0.5435	0.5069	0.4751	0.4478	0.4242	0.4041
GAMMA	1.1542	1.1607	1.1678	1.1754	1.1833	1.1916	1.2000	1.2085	1.2168	1.2250	1.2328	1.2403	1.2472

MOLE FRACTIONS

N1O1(G)	0.48668	0.51039	0.53116	0.54921	0.56478	0.57816	0.58963	0.59944	0.60783	0.61502	0.62117	0.62646	0.63101
N1O2(G)	0.26999	0.23441	0.20326	0.17619	0.15283	0.13276	0.11556	0.10084	0.08825	0.07748	0.06824	0.06031	0.05348
O2(G)	0.24334	0.25520	0.26558	0.27460	0.28239	0.28908	0.29481	0.29972	0.30392	0.30751	0.31059	0.31323	0.31551

EQUILIBRIUM THERMODYNAMIC PROPERTIES

P, ATM	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000	3.000
T, DEG K	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280
H, CAL/G	639.1	646.7	654.0	661.1	668.0	674.7	681.3	687.8	694.2	700.4	706.6	712.7
S, CAL/(G)(K)	1.8921	1.8992	1.9059	1.9123	1.9184	1.9243	1.9299	1.9353	1.9406	1.9457	1.9506	1.9555
M, MOL WT	31.402	31.324	31.256	31.197	31.145	31.100	31.061	31.026	30.995	30.968	30.943	30.921
(DLM/DLP)T	0.01081	0.00975	0.00882	0.00799	0.00725	0.00660	0.00602	0.00551	0.00505	0.00463	0.00427	0.00394
(DLM/DLT)P	-0.1416	-0.1253	-0.1112	-0.0989	-0.0881	-0.0788	-0.0706	-0.0634	-0.0572	-0.0516	-0.0467	-0.0424
CP, CAL/(G)(K)	0.3870	0.3723	0.3599	0.3493	0.3402	0.3325	0.3260	0.3204	0.3156	0.3115	0.3080	0.3050
GAMMA	1.2536	1.2595	1.2647	1.2694	1.2735	1.2772	1.2803	1.2830	1.2853	1.2873	1.2890	1.2904

MOLE FRACTIONS

N1O1(G)	0.63494	0.63833	0.64128	0.64385	0.64608	0.64805	0.64977	0.65129	0.65263	0.65382	0.65488	0.65582
N1O2(G)	0.04760	0.04250	0.03808	0.03423	0.03087	0.02793	0.02535	0.02307	0.02105	0.01927	0.01768	0.01627
O2(G)	0.31747	0.31917	0.32064	0.32192	0.32304	0.32402	0.32488	0.32564	0.32632	0.32691	0.32744	0.32791

TABLE III. - Continued. THERMODYNAMIC PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

[P is pressure, T is temperature, H is enthalpy, S is entropy, (DLM/DLP)T ≡ $(\partial \ln M/\partial \ln P)_T$, (DLM/DLT)P ≡ $(\partial \ln M/\partial \ln T)_P$, CP is heat capacity at constant pressure, and GAMMA is isentropic exponent $(\partial \ln P/\partial \ln \rho)_S$ where ρ is density.]

(b) Continued. NO_2-N_2O_4-NO-O_2 system

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	10.000	10.000	10.000	10.00	10.00	10.00	10.000	10.000	10.00	10.000	10.00	10.000	10.00
T, DEG K	300	320	340	360	380	400	420	440	460	480	500	520	540
H, CAL/G	35.5	49.4	69.9	97.6	129.2	158.0	179.5	194.2	204.8	213.5	221.6	230.0	238.9
S, CAL/(G)(K)	0.7764	0.8213	0.8833	0.9522	1.0476	1.1216	1.1741	1.2083	1.2319	1.2505	1.2671	1.2834	1.3002
M, MOL WT	86.443	81.354	74.136	65.767	58.102	52.604	49.359	47.627	46.700	46.150	45.760	45.418	45.067
(DLM/DLP)T	0.03016	0.05695	0.09155	0.12006	0.12194	0.09503	0.06092	0.03576	0.02111	0.01357	0.01017	0.00918	0.00969
(DLM/DLT)P	-0.6913	-1.2226	-1.8472	-2.2848	-2.1964	-1.6273	-0.9993	-0.5708	-0.3392	-0.2314	-0.1932	-0.1943	-0.2197
CP, CAL/(G)(K)	0.5652	0.8474	1.2097	1.5277	1.5696	1.2722	0.8839	0.6103	0.4690	0.4138	0.4070	0.4278	0.4655
GAMMA	1.0943	1.0934	1.0966	1.1030	1.1120	1.1235	1.1379	1.1533	1.1649	1.1685	1.1651	1.1584	1.1511
MOLE FRACTIONS													
N1O1(G)	0.00001	0.00005	0.00017	0.00045	0.00105	0.00213	0.00388	0.00654	0.01042	0.01585	0.02323	0.03291	0.04525
N1O2(G)	0.12110	0.23165	0.38829	0.56963	0.73503	0.85239	0.91941	0.95172	0.96413	0.96520	0.95894	0.94702	0.92996
N2O4(G)	0.87888	0.76827	0.61146	0.42969	0.26339	0.14442	0.07478	0.03847	0.02024	0.01102	0.00622	0.00362	0.00217
O2(G)	0.00001	0.00003	0.00008	0.00023	0.00053	0.00106	0.00194	0.00327	0.00521	0.00793	0.01161	0.01645	0.02262

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	10.00	10.000	10.00	10.00	10.00	10.000	10.00	10.000	10.000	10.000	10.00	10.000
T, DEG K	560	580	600	620	640	660	680	700	720	740	760	780
H, CAL/G	248.6	259.5	271.5	284.8	299.4	315.2	332.1	350.1	368.8	388.0	407.5	426.9
S, CAL/(G)(K)	1.3180	1.3370	1.3574	1.3792	1.4024	1.4267	1.4520	1.4779	1.5043	1.5306	1.5566	1.5819
M, MOL WT	44.677	44.230	43.718	43.138	42.496	41.798	41.056	40.286	39.503	38.723	37.962	37.233
(DLM/DLP)T	0.01123	0.01353	0.01642	0.01974	0.02334	0.02704	0.03066	0.03400	0.03689	0.03916	0.04073	0.04155
(DLM/DLT)P	-0.2611	-0.3139	-0.3746	-0.4397	-0.5060	-0.5700	-0.6281	-0.6772	-0.7146	-0.7383	-0.7478	-0.7432
CP, CAL/(G)(K)	0.5145	0.5712	0.6328	0.6967	0.7601	0.8200	0.8735	0.9177	0.9503	0.9698	0.9755	0.9678
GAMMA	1.1445	1.1393	1.1355	1.1329	1.1315	1.1311	1.1315	1.1328	1.1347	1.1373	1.1405	1.1442
MOLE FRACTIONS												
N1O1(G)	0.06054	0.07897	0.10063	0.12542	0.15312	0.18330	0.21544	0.24886	0.28286	0.31673	0.34979	0.38147
N1O2(G)	0.90786	0.88071	0.84853	0.81152	0.77010	0.72490	0.67675	0.62665	0.57567	0.52488	0.47530	0.42778
N2O4(G)	0.00134	0.00084	0.00053	0.00034	0.00022	0.00014	0.00009	0.00006	0.00004	0.00003	0.00002	0.00001
O2(G)	0.03027	0.03949	0.05031	0.06271	0.07656	0.09165	0.10772	0.12443	0.14143	0.15836	0.17489	0.19074

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	10.00	10.00	10.00	10.00	10.000	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
T, DEG K	800	820	840	860	880	900	920	940	960	980	1000	1020	1040
H, CAL/G	446.1	464.8	482.8	499.9	516.2	531.5	545.9	559.3	571.9	583.8	594.9	605.3	615.2
S, CAL/(G)(K)	1.6061	1.6292	1.6508	1.6710	1.6897	1.7069	1.7227	1.7372	1.7505	1.7627	1.7739	1.7843	1.7938
M, MOL WT	36.546	35.909	35.325	34.796	34.322	33.901	33.528	33.200	32.912	32.660	32.440	32.248	32.080
(DLM/DLP)T	0.04163	0.04103	0.03984	0.03820	0.03621	0.03402	0.03171	0.02937	0.02708	0.02488	0.02279	0.02085	0.01905
(DLM/DLT)P	-0.7259	-0.6978	-0.6613	-0.6191	-0.5735	-0.5265	-0.4799	-0.4350	-0.3925	-0.3530	-0.3169	-0.2840	-0.2544
CP, CAL/(G)(K)	0.9477	0.9174	0.8793	0.8358	0.7894	0.7422	0.6959	0.6517	0.6104	0.5725	0.5381	0.5073	0.4799
GAMMA	1.1485	1.1532	1.1584	1.1641	1.1701	1.1765	1.1832	1.1901	1.1972	1.2044	1.2116	1.2187	1.2256
MOLE FRACTIONS													
N1O1(G)	0.41133	0.43903	0.46441	0.48738	0.50798	0.52631	0.54252	0.55679	0.56930	0.58025	0.58982	0.59818	0.60548
N1O2(G)	0.38300	0.34144	0.30338	0.26892	0.23802	0.21053	0.18621	0.16482	0.14605	0.12963	0.11527	0.10274	0.09178
N2O4(G)	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
O2(G)	0.20566	0.21952	0.23220	0.24369	0.25399	0.26316	0.27126	0.27839	0.28465	0.29012	0.29491	0.29909	0.30274

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	10.00	10.00	10.00	10.00	10.00	10.00	10.000	10.00	10.00	10.00	10.00	10.00
T, DEG K	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280
H, CAL/G	624.5	633.4	641.9	650.1	657.9	665.5	672.9	680.0	687.0	693.8	700.5	707.1
S, CAL/(G)(K)	1.8027	1.8111	1.8189	1.8262	1.8331	1.8397	1.8460	1.8520	1.8578	1.8634	1.8687	1.8739
M, MOL WT	31.933	31.804	31.691	31.592	31.505	31.428	31.360	31.300	31.247	31.199	31.157	31.119
(DLM/DLP)T	0.01740	0.01590	0.01453	0.01329	0.01217	0.01116	0.01025	0.00943	0.00869	0.00802	0.00741	0.00687
(DLM/DLT)P	-0.2279	-0.2042	-0.1832	-0.1645	-0.1479	-0.1332	-0.1202	-0.1087	-0.0984	-0.0893	-0.0812	-0.0740
CP, CAL/(G)(K)	0.4557	0.4345	0.4159	0.3997	0.3856	0.3733	0.3626	0.3533	0.3452	0.3382	0.3321	0.3267
GAMMA	1.2323	1.2386	1.2446	1.2502	1.2553	1.2600	1.2643	1.2682	1.2716	1.2747	1.2774	1.2797
MOLE FRACTIONS												
N1O1(G)	0.61186	0.61745	0.62235	0.62666	0.63045	0.63379	0.63674	0.63936	0.64168	0.64375	0.64560	0.64725
N1O2(G)	0.08220	0.07382	0.06647	0.06001	0.05433	0.04932	0.04489	0.04096	0.03748	0.03437	0.03160	0.02912
O2(G)	0.30593	0.30873	0.31118	0.31333	0.31522	0.31689	0.31837	0.31968	0.32084	0.32188	0.32280	0.32363

TABLE III. - Continued. THERMODYNAMIC PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

[P is pressure, T is temperature, H is enthalpy, S is entropy, (DLM/DLP)T ≡ $(\partial \ln M/\partial \ln P)_T$, (DLM/DLT)P ≡ $(\partial \ln M/\partial \ln T)_P$, CP is heat capacity at constant pressure, and GAMMA is isentropic exponent $(\partial \ln P/\partial \ln \rho)_s$ where ρ is density.]

(b) Continued. NO_2-N_2O_4-NO-O_2 system

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
T, DEG K	300	320	340	360	380	400	420	440	460	480	500	520	540
H, CAL/G	31.4	41.3	55.2	74.5	99.5	127.9	155.1	177.3	193.8	206.0	215.9	224.7	233.3
S, CAL/(G)(K)	0.7380	0.7697	0.8119	0.8671	0.9344	1.0072	1.0737	1.1254	1.1620	1.1881	1.2083	1.2255	1.2417
M, MOL WT	88.710	85.509	80.575	73.990	66.539	59.544	54.130	50.573	48.459	47.236	46.493	45.988	45.588
(DLM/DLP)T	0.01794	0.03516	0.06094	0.09220	0.11834	0.12449	0.10622	0.07636	0.04971	0.03153	0.02071	0.01488	0.01217
(DLM/DLT)P	-0.4113	-0.7547	-1.2293	-1.7540	-2.1296	-2.1263	-1.7287	-1.1915	-0.7522	-0.4728	-0.3195	-0.2466	-0.2224
CP, CAL/(G)(K)	0.4123	0.5833	0.8235	1.1121	1.3636	1.4335	1.2572	0.9589	0.7007	0.5390	0.4581	0.4295	0.4324
GAMMA	1.0992	1.0959	1.0964	1.1001	1.1064	1.1149	1.1251	1.1369	1.1494	1.1598	1.1651	1.1648	1.1607
MOLE FRACTIONS													
N1O1(G)	0.00001	0.00002	0.00009	0.00024	0.00060	0.00130	0.00249	0.00434	0.00706	0.01089	0.01609	0.02294	0.03172
N1O2(G)	0.07185	0.14138	0.24851	0.39131	0.55255	0.70319	0.81848	0.89209	0.93259	0.95154	0.95729	0.95455	0.94567
N2O4(G)	0.92814	0.85858	0.75136	0.60833	0.44655	0.29486	0.17779	0.10139	0.05681	0.03213	0.01858	0.01104	0.00674
O2(G)	0.00000	0.00001	0.00004	0.00012	0.00030	0.00065	0.00124	0.00217	0.00353	0.00544	0.00804	0.01147	0.01586

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
T, DEG K	560	580	600	620	640	660	680	700	720	740	760	780
H, CAL/G	242.1	251.5	261.7	272.8	284.9	298.0	312.1	327.1	343.1	359.7	377.0	394.6
S, CAL/(G)(K)	1.2578	1.2743	1.2916	1.3098	1.3290	1.3491	1.3701	1.3919	1.4144	1.4372	1.4602	1.4831
M, MOL WT	45.220	44.842	44.432	43.977	43.473	42.919	42.318	41.678	41.007	40.317	39.618	38.923
(DLM/DLP)T	0.01143	0.01200	0.01350	0.01566	0.01833	0.02134	0.02455	0.02783	0.03101	0.03397	0.03656	0.03869
(DLM/DLT)P	-0.2281	-0.2531	-0.2909	-0.3376	-0.3897	-0.4446	-0.4995	-0.5518	-0.5991	-0.6392	-0.6703	-0.6914
CP, CAL/(G)(K)	0.4546	0.4890	0.5314	0.5788	0.6290	0.6798	0.7292	0.7751	0.8156	0.8490	0.8740	0.8896
GAMMA	1.1552	1.1498	1.1452	1.1415	1.1390	1.1374	1.1367	1.1368	1.1376	1.1390	1.1410	1.1435
MOLE FRACTIONS												
N1O1(G)	0.04271	0.05609	0.07204	0.09060	0.11175	0.13533	0.16110	0.18871	0.21771	0.24762	0.27792	0.30810
N1O2(G)	0.93172	0.91316	0.89019	0.86294	0.83161	0.79648	0.75799	0.71670	0.67327	0.62846	0.58304	0.53780
N2O4(G)	0.00422	0.00270	0.00175	0.00116	0.00077	0.00052	0.00035	0.00024	0.00017	0.00011	0.00008	0.00005
O2(G)	0.02135	0.02805	0.03602	0.04530	0.05587	0.06767	0.08055	0.09435	0.10885	0.12381	0.13896	0.15405

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
T, DEG K	800	820	840	860	880	900	920	940	960	980	1000	1020	1040
H, CAL/G	412.5	430.4	448.1	465.5	482.4	498.8	514.5	529.5	543.7	557.3	570.1	582.3	593.8
S, CAL/(G)(K)	1.5057	1.5278	1.5492	1.5696	1.5891	1.6075	1.6247	1.6409	1.6559	1.6698	1.6828	1.6948	1.7060
M, MOL WT	38.242	37.584	36.958	36.368	35.820	35.314	34.852	34.433	34.055	33.715	33.411	33.140	32.898
(DLM/DLP)T	0.04027	0.04127	0.04169	0.04154	0.04089	0.03982	0.03840	0.03673	0.03487	0.03291	0.03091	0.02892	0.02697
(DLM/DLT)P	-0.7018	-0.7017	-0.6917	-0.6732	-0.6475	-0.6163	-0.5812	-0.5438	-0.5054	-0.4671	-0.4297	-0.3939	-0.3601
CP, CAL/(G)(K)	0.8956	0.8920	0.8795	0.8594	0.8330	0.8018	0.7675	0.7315	0.6949	0.6589	0.6242	0.5912	0.5605
GAMMA	1.1465	1.1499	1.1538	1.1580	1.1626	1.1676	1.1728	1.1783	1.1840	1.1899	1.1960	1.2022	1.2083
MOLE FRACTIONS													
N1O1(G)	0.33768	0.36625	0.39346	0.41907	0.44290	0.46487	0.48495	0.50317	0.51961	0.53438	0.54759	0.55939	0.56989
N1O2(G)	0.49344	0.45060	0.40979	0.37138	0.33563	0.30269	0.27258	0.24524	0.22058	0.19843	0.17851	0.16092	0.14516
N2O4(G)	0.00004	0.00003	0.00002	0.00001	0.00001	0.00001	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
O2(G)	0.16884	0.18312	0.19673	0.20954	0.22145	0.23244	0.24247	0.25158	0.25981	0.26719	0.27380	0.27969	0.28495

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
T, DEG K	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280
H, CAL/G	604.7	615.1	625.0	634.4	643.4	652.1	660.5	668.6	676.4	684.0	691.4	698.6
S, CAL/(G)(K)	1.7164	1.7261	1.7352	1.7437	1.7517	1.7592	1.7664	1.7732	1.7796	1.7858	1.7917	1.7974
M, MOL WT	32.683	32.492	32.322	32.171	32.037	31.917	31.810	31.714	31.629	31.553	31.484	31.422
(DLM/DLP)T	0.02509	0.02330	0.02162	0.02004	0.01858	0.01722	0.01597	0.01481	0.01376	0.01279	0.01190	0.01108
(DLM/DLT)P	-0.3285	-0.2993	-0.2725	-0.2480	-0.2257	-0.2055	-0.1872	-0.1707	-0.1558	-0.1424	-0.1303	-0.1194
CP, CAL/(G)(K)	0.5321	0.5062	0.4828	0.4616	0.4427	0.4258	0.4107	0.3974	0.3855	0.3750	0.3657	0.3574
GAMMA	1.2145	1.2205	1.2264	1.2321	1.2375	1.2427	1.2475	1.2520	1.2562	1.2601	1.2636	1.2668
MOLE FRACTIONS												
N1O1(G)	0.57924	0.58754	0.59493	0.60150	0.60735	0.61255	0.61720	0.62135	0.62506	0.62839	0.63138	0.63406
N1O2(G)	0.13115	0.11868	0.10760	0.09775	0.08898	0.08117	0.07420	0.06797	0.06241	0.05742	0.05294	0.04891
O2(G)	0.28962	0.29377	0.29747	0.30075	0.30367	0.30628	0.30860	0.31068	0.31253	0.31419	0.31569	0.31703

TABLE III. - Concluded. THERMODYNAMIC PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

[P is pressure, T is temperature, H is enthalpy, S is entropy, (DLM/DLP)T ≡ $(\partial \ln M/\partial \ln P)_T$, (DLM/DLT)P ≡ $(\partial \ln M/\partial \ln T)_P$, CP is heat capacity at constant pressure, and GAMMA is isentropic exponent $(\partial \ln P/\partial \ln \rho)_S$ where ρ is density.]

(b) Concluded. NO_2-N_2O_4-NO-O_2 system

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	100.0	100.0	100.0	100.0	100.0	100.00	100.0	100.0	100.0	100.00	100.0	100.0	100.0
T, DEG K	300	320	340	360	380	400	420	440	460	480	500	520	540
H, CAL/G	28.9	36.2	45.8	58.7	75.6	96.9	121.5	146.8	169.8	188.6	203.5	215.4	225.5
S, CAL/(G)(K)	0.7029	0.7263	0.7554	0.7922	0.8379	0.8924	0.9523	1.0112	1.0623	1.1026	1.1329	1.1562	1.1754
M, MOL WT	90.174	88.327	85.333	80.982	75.347	68.917	62.537	57.068	52.972	50.204	48.434	47.305	46.554
(DLM/DLP)T	0.01000	0.02001	0.03610	0.05887	0.08622	0.11162	0.12510	0.11981	0.09912	0.07353	0.05140	0.03551	0.02527
(DLM/DLT)P	-0.2293	-0.4295	-0.7282	-1.1197	-1.5509	-1.9043	-2.0302	-1.8558	-1.4720	-1.0545	-0.7207	-0.4971	-0.3637
CP, CAL/(G)(K)	0.3171	0.4146	0.5547	0.7400	0.9571	1.1612	1.2740	1.2306	1.0532	0.8363	0.6581	0.5421	0.4796
GAMMA	1.1050	1.1000	1.0980	1.0991	1.1027	1.1084	1.1160	1.1248	1.1345	1.1445	1.1537	1.1603	1.1631
MOLE FRACTIONS													
N1O1(G)	0.00000	0.00001	0.00004	0.00012	0.00030	0.00069	0.00141	0.00260	0.00441	0.00700	0.01053	0.01521	0.02124
N1O2(G)	0.04002	0.08015	0.14518	0.23963	0.36171	0.50068	0.63791	0.75441	0.83981	0.89480	0.92621	0.94137	0.94567
N2O4(G)	0.95997	0.91983	0.85476	0.76023	0.63784	0.49828	0.35998	0.24169	0.15358	0.09470	0.05799	0.03581	0.02248
O2(G)	0.00000	0.00000	0.00002	0.00006	0.00015	0.00035	0.00071	0.00130	0.00220	0.00350	0.00527	0.00761	0.01062

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	100.00	100.0	100.00	100.0	100.00	100.00	100.0	100.00	100.0	100.0	100.00	100.00
T, DEG K	560	580	600	620	640	660	680	700	720	740	760	780
H, CAL/G	234.8	243.9	253.1	262.7	272.9	283.8	295.5	307.9	321.0	334.9	349.5	364.6
S, CAL/(G)(K)	1.1923	1.2082	1.2238	1.2396	1.2558	1.2725	1.2899	1.3079	1.3264	1.3454	1.3648	1.3844
M, MOL WT	46.007	45.564	45.162	44.765	44.354	43.915	43.443	42.938	42.400	41.834	41.245	40.642
(DLM/DLP)T	0.01919	0.01596	0.01466	0.01469	0.01566	0.01731	0.01946	0.02195	0.02465	0.02744	0.03020	0.03283
(DLM/DLT)P	-0.2933	-0.2643	-0.2622	-0.2780	-0.3058	-0.3416	-0.3824	-0.4257	-0.4693	-0.5114	-0.5502	-0.5842
CP, CAL/(G)(K)	0.4547	0.4542	0.4695	0.4950	0.5270	0.5630	0.6009	0.6392	0.6763	0.7110	0.7420	0.7684
GAMMA	1.1624	1.1594	1.1556	1.1518	1.1485	1.1460	1.1442	1.1432	1.1428	1.1431	1.1440	1.1453
MOLE FRACTIONS												
N1O1(G)	0.02881	0.03810	0.04929	0.06247	0.07771	0.09501	0.11431	0.13546	0.15827	0.18247	0.20776	0.23379
N1O2(G)	0.94240	0.93345	0.91982	0.90207	0.88054	0.85547	0.82713	0.79582	0.76189	0.72580	0.68800	0.64905
N2O4(G)	0.01439	0.00940	0.00625	0.00422	0.00290	0.00201	0.00141	0.00099	0.00071	0.00050	0.00036	0.00026
O2(G)	0.01440	0.01905	0.02464	0.03124	0.03886	0.04751	0.05715	0.06773	0.07913	0.09123	0.10388	0.11690

EQUILIBRIUM THERMODYNAMIC PROPERTIES													
P, ATM	100.00	100.00	100.0	100.0	100.0	100.00	100.00	100.0	100.0	100.0	100.0	100.0	100.0
T, DEG K	800	820	840	860	880	900	920	940	960	980	1000	1020	1040
H, CAL/G	380.1	396.1	412.3	428.5	444.8	460.9	476.7	492.3	507.4	522.0	536.1	549.7	562.7
S, CAL/(G)(K)	1.4042	1.4238	1.4433	1.4625	1.4812	1.4992	1.5167	1.5334	1.5492	1.5643	1.5786	1.5920	1.6047
M, MOL WT	40.030	39.419	38.815	38.225	37.655	37.109	36.593	36.107	35.653	35.233	34.845	34.489	34.163
(DLM/DLP)T	0.03524	0.03734	0.03906	0.04037	0.04124	0.04167	0.04169	0.04132	0.04061	0.03961	0.03838	0.03698	0.03544
(DLM/DLT)P	-0.6123	-0.6334	-0.6472	-0.6535	-0.6524	-0.6446	-0.6307	-0.6116	-0.5884	-0.5620	-0.5335	-0.5036	-0.4732
CP, CAL/(G)(K)	0.7892	0.8039	0.8122	0.8141	0.8098	0.7998	0.7849	0.7658	0.7435	0.7188	0.6926	0.6655	0.6383
GAMMA	1.1472	1.1494	1.1520	1.1550	1.1584	1.1620	1.1659	1.1701	1.1744	1.1790	1.1838	1.1887	1.1938
MOLE FRACTIONS													
N1O1(G)	0.26023	0.28671	0.31289	0.33849	0.36323	0.38690	0.40935	0.43046	0.45016	0.46843	0.48529	0.50076	0.51492
N1O2(G)	0.60947	0.56980	0.53056	0.49220	0.45510	0.41961	0.38595	0.35429	0.32474	0.29734	0.27206	0.24885	0.22752
N2O4(G)	0.00019	0.00014	0.00010	0.00007	0.00005	0.00004	0.00003	0.00002	0.00001	0.00001	0.00001	0.00001	0.00000
O2(G)	0.13011	0.14335	0.15645	0.16924	0.18161	0.19345	0.20468	0.21523	0.22508	0.23422	0.24265	0.25038	0.25746

EQUILIBRIUM THERMODYNAMIC PROPERTIES												
P, ATM	100.0	100.0	100.00	100.0	100.00	100.00	100.00	100.0	100.0	100.0	100.0	100.0
T, DEG K	1060	1080	1100	1120	1140	1160	1180	1200	1220	1240	1260	1280
H, CAL/G	575.2	587.2	598.6	609.6	620.2	630.3	640.0	649.4	658.4	667.1	675.6	683.8
S, CAL/(G)(K)	1.6166	1.6278	1.6383	1.6482	1.6575	1.6663	1.6746	1.6825	1.6900	1.6971	1.7038	1.7103
M, MOL WT	33.866	33.596	33.352	33.130	32.929	32.747	32.582	32.433	32.299	32.177	32.066	31.966
(DLM/DLP)T	0.03382	0.03216	0.03049	0.02884	0.02722	0.02566	0.02416	0.02273	0.02138	0.02010	0.01890	0.01778
(DLM/DLT)P	-0.4429	-0.4131	-0.3844	-0.3568	-0.3307	-0.3062	-0.2833	-0.2619	-0.2421	-0.2239	-0.2070	-0.1915
CP, CAL/(G)(K)	0.6116	0.5857	0.5610	0.5376	0.5158	0.4955	0.4768	0.4596	0.4439	0.4296	0.4166	0.4049
GAMMA	1.1989	1.2041	1.2093	1.2144	1.2195	1.2244	1.2293	1.2339	1.2383	1.2426	1.2465	1.2504
MOLE FRACTIONS												
N1O1(G)	0.52781	0.53954	0.55019	0.55983	0.56857	0.57647	0.58362	0.59009	0.59595	0.60126	0.60607	0.61044
N1O2(G)	0.20827	0.19068	0.17472	0.16025	0.14715	0.13529	0.12457	0.11486	0.10607	0.09811	0.09089	0.08435
O2(G)	0.26391	0.26977	0.27509	0.27992	0.28428	0.28824	0.29181	0.29505	0.29798	0.30063	0.30304	0.30522

TABLE IV. - TRANSPORT PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

(a) NO_2-N_2O_4 system

Temperature, °K	Viscosity, poises	Thermal conductivity, cal/(cm)(sec)(°K)					Heat capacity, c_p, cal/(g)(°K)		Prandtl number		Lewis number
		Monatomic	Internal	Frozen	Reaction	Equilibrium	Frozen	Equilibrium	Frozen	Equilibrium	
Pressure, 0.01 atm											
300	162.X10-6	25.X10-6	19.X10-5	44.X10-5	141.X10-6	185.X10-6	0.1940	1.1792	0.7089	1.0312	0.6259
320	174.	28.	21.	49.	38.	87.	0.1970	0.4590	0.7069	0.9212	0.5925
340	185.	30.	23.	52.	11.	63.	0.2002	0.2698	0.7072	0.7916	0.5863
360	195.	32.	25.	56.	3.	59.	0.2036	0.2241	0.7080	0.7359	0.5855
380	205.	33.	27.	60.	1.	61.	0.2070	0.2138	0.7090	0.7184	0.5882
400	214.	35.	29.	63.	0.	64.	0.2104	0.2128	0.7098	0.7132	0.5906
420	223.	36.	31.	67.	0.	67.	0.2137	0.2147	0.7105	0.7119	0.5923
440	232.	38.	33.	71.	0.	71.	0.2169	0.2174	0.7113	0.7118	0.5943
460	241.	39.	35.	74.	0.	75.	0.2201	0.2203	0.7119	0.7122	0.5943
480	249.	40.	38.	78.	0.	78.	0.2233	0.2234	0.7126	0.7127	0.5867
500	258.	42.	40.	82.	0.	82.	0.2263	0.2264	0.7132	0.7133	
520	266.	43.	42.	86.	0.	86.	0.2293	0.2293	0.7138	0.7139	
540	274.	44.	45.	89.	0.	89.	0.2322	0.2322	0.7144	0.7144	
560	282.	46.	47.	93.	0.	93.	0.2350	0.2350	0.7149	0.7149	
580	290.	47.	49.	96.	0.	96.	0.2377	0.2377	0.7154	0.7154	
600	298.	48.	52.	100.	0.	100.	0.2403	0.2403	0.7155	0.7155	
620	306.	50.	54.	104.	0.	104.	0.2428	0.2428	0.7160	0.7160	
640	313.	51.	57.	107.	0.	107.	0.2453	0.2453	0.7164	0.7164	
660	321.	52.	59.	111.	0.	111.	0.2476	0.2476	0.7168	0.7168	
680	328.	53.	61.	114.	0.	114.	0.2498	0.2498	0.7168	0.7168	
700	335.	54.	63.	118.	0.	118.	0.2519	0.2519	0.7172	0.7172	
720	342.	55.	66.	121.	0.	121.	0.2540	0.2540	0.7175	0.7175	
740	350.	57.	68.	125.	0.	125.	0.2559	0.2559	0.7174	0.7174	
760	357.	58.	70.	128.	0.	128.	0.2578	0.2578	0.7177	0.7177	
780	363.	59.	72.	131.	0.	131.	0.2595	0.2595	0.7180	0.7180	
800	370.	60.	75.	135.	0.	135.	0.2612	0.2612	0.7182	0.7182	
820	377.	61.	77.	138.	0.	138.	0.2628	0.2628	0.7185	0.7185	
840	383.	62.	79.	141.	0.	141.	0.2643	0.2643	0.7183	0.7183	
860	390.	63.	81.	144.	0.	144.	0.2657	0.2657	0.7185	0.7185	
880	397.	64.	83.	147.	0.	147.	0.2671	0.2671	0.7187	0.7187	
900	403.	65.	85.	151.	0.	151.	0.2684	0.2684	0.7185	0.7185	
920	409.	66.	87.	154.	0.	154.	0.2697	0.2697	0.7187	0.7187	
940	416.	67.	89.	157.	0.	157.	0.2709	0.2709	0.7189	0.7189	
960	422.	68.	91.	160.	0.	160.	0.2720	0.2720	0.7187	0.7187	
980	428.	69.	93.	163.	0.	163.	0.2732	0.2732	0.7188	0.7188	
1000	434.	70.	95.	166.	0.	166.	0.2743	0.2743	0.7190	0.7190	
1020	440.	71.	97.	169.	0.	169.	0.2752	0.2752	0.7187	0.7187	
1040	446.	72.	99.	171.	0.	171.	0.2761	0.2761	0.7188	0.7188	
1060	452.	73.	101.	174.	0.	174.	0.2769	0.2769	0.7189	0.7189	
1080	458.	74.	103.	177.	0.	177.	0.2777	0.2777	0.7190	0.7190	
1100	464.	75.	104.	180.	0.	180.	0.2785	0.2785	0.7191	0.7191	
1120	470.	76.	106.	182.	0.	182.	0.2793	0.2793	0.7192	0.7192	
1140	475.	77.	108.	185.	0.	185.	0.2800	0.2800	0.7190	0.7190	
1160	481.	78.	110.	188.	0.	188.	0.2808	0.2808	0.7191	0.7191	
1180	487.	79.	112.	191.	0.	191.	0.2815	0.2815	0.7191	0.7191	
1200	492.	80.	113.	193.	0.	193.	0.2822	0.2822	0.7192	0.7192	
1220	498.	81.	115.	196.	0.	196.	0.2829	0.2829	0.7193	0.7193	
1240	503.	82.	117.	199.	0.	199.	0.2836	0.2836	0.7190	0.7190	
1260	509.	82.	119.	201.	0.	201.	0.2842	0.2842	0.7191	0.7191	
1280	515.	83.	120.	204.	0.	204.	0.2849	0.2849	0.7192	0.7192	

TABLE IV. - Continued. TRANSPORT PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

(a) Continued. NO_2-N_2O_4 system

Temper-ature, °K	Viscosity, poises	Thermal conductivity, cal/(cm)(sec)(°K)					Heat capacity, c_p, cal/(g)(°K)		Prandtl number		Lewis number
		Monatomic	Internal	Frozen	Reaction	Equilibrium	Frozen	Equilibrium	Frozen	Equilibrium	
Pressure, 0.1 atm											
300	149.X10-6	20.X10-6	21.X10-6	41.X10-6	382.X10-6	422.X10-6	0.1969	2.3688	0.7219	0.8335	0.8540
320	168.	25.	22.	47.	232.	278.	0.1989	1.6430	0.7148	0.9929	0.6813
340	183.	29.	23.	52.	90.	142.	0.2011	0.7696	0.7104	0.9917	0.6160
360	194.	31.	25.	56.	31.	87.	0.2040	0.3952	0.7092	0.8812	0.5967
380	204.	33.	27.	60.	11.	71.	0.2072	0.2732	0.7095	0.7871	0.5920
400	214.	35.	29.	63.	4.	68.	0.2104	0.2350	0.7100	0.7417	0.5922
420	223.	36.	31.	67.	2.	69.	0.2137	0.2236	0.7106	0.7237	0.5932
440	232.	38.	33.	71.	1.	72.	0.2170	0.2213	0.7113	0.7170	0.5951
460	241.	39.	35.	74.	0.	75.	0.2201	0.2222	0.7120	0.7146	0.5964
480	249.	40.	38.	78.	0.	78.	0.2233	0.2243	0.7126	0.7139	0.5976
500	258.	42.	40.	82.	0.	82.	0.2263	0.2268	0.7132	0.7139	0.5979
520	266.	43.	42.	86.	0.	86.	0.2293	0.2296	0.7138	0.7142	0.5940
540	274.	44.	45.	89.	0.	89.	0.2322	0.2324	0.7144	0.7146	0.5847
560	282.	46.	47.	93.	0.	93.	0.2350	0.2351	0.7149	0.7150	0.5803
580	290.	47.	49.	96.	0.	96.	0.2377	0.2378	0.7154	0.7155	0.6055
600	298.	48.	52.	100.	0.	100.	0.2403	0.2404	0.7155	0.7156	
620	306.	50.	54.	104.	0.	104.	0.2428	0.2429	0.7160	0.7160	
640	313.	51.	57.	107.	0.	107.	0.2453	0.2453	0.7164	0.7164	
660	321.	52.	59.	111.	0.	111.	0.2476	0.2476	0.7168	0.7168	
680	328.	53.	61.	114.	0.	114.	0.2498	0.2498	0.7168	0.7168	
700	335.	54.	63.	118.	0.	118.	0.2519	0.2519	0.7172	0.7172	
720	342.	55.	66.	121.	0.	121.	0.2540	0.2540	0.7175	0.7175	
740	350.	57.	68.	125.	0.	125.	0.2559	0.2559	0.7174	0.7174	
760	357.	58.	70.	128.	0.	128.	0.2578	0.2578	0.7177	0.7177	
780	363.	59.	72.	131.	0.	131.	0.2595	0.2595	0.7180	0.7180	
800	370.	60.	75.	135.	0.	135.	0.2612	0.2612	0.7182	0.7182	
820	377.	61.	77.	138.	0.	138.	0.2628	0.2628	0.7185	0.7185	
840	383.	62.	79.	141.	0.	141.	0.2643	0.2643	0.7183	0.7183	
860	390.	63.	81.	144.	0.	144.	0.2657	0.2657	0.7185	0.7185	
880	397.	64.	83.	147.	0.	147.	0.2671	0.2671	0.7187	0.7187	
900	403.	65.	85.	151.	0.	151.	0.2684	0.2684	0.7185	0.7185	
920	409.	66.	87.	154.	0.	154.	0.2697	0.2697	0.7187	0.7187	
940	416.	67.	89.	157.	0.	157.	0.2709	0.2709	0.7189	0.7189	
960	422.	68.	91.	160.	0.	160.	0.2720	0.2720	0.7187	0.7187	
980	428.	69.	93.	163.	0.	163.	0.2732	0.2732	0.7188	0.7188	
1000	434.	70.	95.	166.	0.	166.	0.2743	0.2743	0.7190	0.7190	
1020	440.	71.	97.	169.	0.	169.	0.2752	0.2752	0.7187	0.7187	
1040	446.	72.	99.	171.	0.	171.	0.2761	0.2761	0.7188	0.7188	
1060	452.	73.	101.	174.	0.	174.	0.2769	0.2769	0.7189	0.7189	
1080	458.	74.	103.	177.	0.	177.	0.2777	0.2777	0.7190	0.7190	
1100	464.	75.	104.	180.	0.	180.	0.2785	0.2785	0.7191	0.7192	
1120	470.	76.	106.	182.	0.	182.	0.2793	0.2793	0.7192	0.7192	
1140	475.	77.	108.	185.	0.	185.	0.2800	0.2800	0.7190	0.7190	
1160	481.	78.	110.	188.	0.	188.	0.2808	0.2808	0.7191	0.7191	
1180	487.	79.	112.	191.	0.	191.	0.2815	0.2815	0.7191	0.7191	
1200	492.	80.	113.	193.	0.	193.	0.2822	0.2822	0.7192	0.7192	
1220	498.	81.	115.	196.	0.	196.	0.2829	0.2829	0.7193	0.7193	
1240	503.	82.	117.	199.	0.	199.	0.2836	0.2836	0.7190	0.7190	
1260	509.	82.	119.	201.	0.	201.	0.2842	0.2842	0.7191	0.7191	
1280	515.	83.	120.	204.	0.	204.	0.2849	0.2849	0.7192	0.7192	

TABLE IV. - Continued. TRANSPORT PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

(a) Continued. NO_2-N_2O_4 system

Temperature, °K	Viscosity, poises	Thermal conductivity, cal/(cm)(sec)(°K)					Heat capacity, c_p, cal/(g)(°K)		Prandtl number		Lewis number
		Monatomic	Internal	Frozen	Reaction	Equilibrium	Frozen	Equilibrium	Frozen	Equilibrium	
		Pressure, 1 atm									
300	133.X10-6	14.X10-6	23.X10-5	36.X10-6	246.X10-6	282.X10-6	0.1997	1.2895	0.7292	0.6056	1.2415
320	151.	18.	24.	42.	340.	382.	0.2034	1.8358	0.7289	0.7259	1.0047
340	171.	23.	25.	48.	317.	365.	0.2053	1.8827	0.7240	0.8804	0.8006
360	188.	28.	26.	54.	195.	249.	0.2066	1.2988	0.7176	0.9812	0.6805
380	202.	32.	27.	59.	92.	151.	0.2085	0.7288	0.7137	0.9723	0.6274
400	213.	34.	29.	63.	40.	103.	0.2111	0.4329	0.7119	0.8913	0.6074
420	222.	36.	31.	67.	18.	85.	0.2140	0.3088	0.7116	0.8111	0.6001
440	232.	37.	33.	71.	8.	79.	0.2171	0.2595	0.7118	0.7617	0.5985
460	241.	39.	36.	74.	4.	78.	0.2202	0.2402	0.7122	0.7368	0.5984
480	249.	40.	38.	78.	2.	80.	0.2233	0.2333	0.7127	0.7252	0.5990
500	258.	42.	40.	82.	1.	83.	0.2264	0.2316	0.7133	0.7198	0.6005
520	266.	43.	42.	86.	1.	86.	0.2293	0.2322	0.7138	0.7174	0.6019
540	274.	44.	45.	89.	0.	90.	0.2322	0.2338	0.7144	0.7154	0.6026
560	282.	46.	47.	93.	0.	93.	0.2350	0.2360	0.7149	0.7161	0.6023
580	290.	47.	49.	96.	0.	97.	0.2377	0.2383	0.7154	0.7161	0.6017
600	298.	48.	52.	100.	0.	100.	0.2403	0.2407	0.7155	0.7160	0.6004
620	306.	50.	54.	104.	0.	104.	0.2428	0.2431	0.7160	0.7163	0.6100
640	313.	51.	57.	107.	0.	107.	0.2453	0.2454	0.7164	0.7166	0.5888
660	321.	52.	59.	111.	0.	111.	0.2476	0.2477	0.7168	0.7169	0.6132
680	328.	53.	61.	114.	0.	114.	0.2498	0.2499	0.7168	0.7169	0.6123
700	335.	54.	63.	118.	0.	118.	0.2519	0.2520	0.7172	0.7172	
720	342.	55.	66.	121.	0.	121.	0.2540	0.2540	0.7175	0.7175	
740	350.	57.	68.	125.	0.	125.	0.2559	0.2559	0.7174	0.7175	
760	357.	58.	70.	128.	0.	128.	0.2578	0.2578	0.7177	0.7177	
780	363.	59.	72.	131.	0.	131.	0.2595	0.2595	0.7180	0.7180	
800	370.	60.	75.	135.	0.	135.	0.2612	0.2612	0.7182	0.7182	
820	377.	61.	77.	138.	0.	138.	0.2628	0.2628	0.7185	0.7185	
840	383.	62.	79.	141.	0.	141.	0.2643	0.2643	0.7183	0.7183	
860	390.	63.	81.	144.	0.	144.	0.2657	0.2657	0.7185	0.7185	
880	397.	64.	83.	147.	0.	147.	0.2671	0.2671	0.7187	0.7187	
900	403.	65.	85.	151.	0.	151.	0.2684	0.2684	0.7185	0.7186	
920	409.	66.	87.	154.	0.	154.	0.2697	0.2697	0.7187	0.7187	
940	416.	67.	89.	157.	0.	157.	0.2709	0.2709	0.7189	0.7189	
960	422.	68.	91.	160.	0.	160.	0.2720	0.2720	0.7187	0.7187	
980	428.	69.	93.	163.	0.	163.	0.2732	0.2732	0.7188	0.7188	
1000	434.	70.	95.	166.	0.	166.	0.2743	0.2743	0.7190	0.7190	
1020	440.	71.	97.	169.	0.	169.	0.2752	0.2752	0.7187	0.7187	
1040	446.	72.	99.	171.	0.	171.	0.2761	0.2761	0.7188	0.7188	
1060	452.	73.	101.	174.	0.	174.	0.2769	0.2769	0.7189	0.7189	
1080	458.	74.	103.	177.	0.	177.	0.2777	0.2777	0.7190	0.7191	
1100	464.	75.	104.	180.	0.	180.	0.2785	0.2785	0.7191	0.7192	
1120	470.	76.	106.	182.	0.	182.	0.2793	0.2793	0.7192	0.7193	
1140	475.	77.	108.	185.	0.	185.	0.2800	0.2800	0.7190	0.7190	
1160	481.	78.	110.	188.	0.	188.	0.2808	0.2808	0.7191	0.7191	
1180	487.	79.	112.	191.	0.	191.	0.2815	0.2815	0.7191	0.7192	
1200	492.	80.	113.	193.	0.	193.	0.2822	0.2822	0.7192	0.7192	
1220	498.	81.	115.	196.	0.	196.	0.2829	0.2829	0.7193	0.7193	
1240	503.	82.	117.	199.	0.	199.	0.2836	0.2836	0.7190	0.7190	
1260	509.	82.	119.	201.	0.	201.	0.2842	0.2842	0.7191	0.7191	
1280	515.	83.	120.	204.	0.	204.	0.2849	0.2849	0.7192	0.7192	

TABLE IV. - Continued. TRANSPORT PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

(a) Continued. NO_2-N_2O_4 system

Temper-ature, ^{o}K	Viscosity, poises	Thermal conductivity, cal/(cm)(sec)(^{o}K)					Heat capacity, c_p, cal/(g)(^{o}K)		Prandtl number		Lewis number
		Monatomic	Internal	Frozen	Reaction	Equilibrium	Frozen	Equilibrium	Frozen	Equilibrium	
Pressure, 10 atm											
300	125.X10-6	11.X10-6	23.X10-6	34.X10-6	93.X10-6	127.X10-6	0.2009	0.5650	0.7293	0.5562	1.4827
320	138.	13.	26.	39.	163.	202.	0.2062	0.8465	0.7319	0.5767	1.3558
340	152.	16.	28.	44.	245.	289.	0.2103	1.2070	0.7332	0.6366	1.1838
360	170.	20.	29.	49.	302.	351.	0.2130	1.5207	0.7328	0.7356	0.9955
380	188.	25.	30.	55.	288.	343.	0.2144	1.5558	0.7290	0.8521	0.8324
400	204.	30.	31.	61.	211.	272.	0.2153	1.2499	0.7233	0.9392	0.7223
420	218.	33.	32.	66.	127.	193.	0.2167	0.8508	0.7186	0.9623	0.6602
440	229.	36.	34.	70.	69.	139.	0.2186	0.5619	0.7158	0.9250	0.6297
460	239.	38.	36.	74.	37.	111.	0.2211	0.3997	0.7145	0.8629	0.6150
480	249.	40.	38.	78.	20.	98.	0.2238	0.3174	0.7140	0.8073	0.6083
500	257.	41.	40.	82.	11.	93.	0.2267	0.2771	0.7141	0.7692	0.6060
520	266.	43.	42.	85.	6.	92.	0.2295	0.2576	0.7143	0.7464	0.6054
540	274.	44.	45.	89.	4.	93.	0.2323	0.2486	0.7147	0.7336	0.6058
560	282.	46.	47.	93.	2.	95.	0.2351	0.2448	0.7151	0.7264	0.6065
580	290.	47.	49.	96.	1.	98.	0.2378	0.2438	0.7155	0.7225	0.6075
600	298.	48.	52.	100.	1.	101.	0.2404	0.2442	0.7156	0.7200	0.6080
620	306.	50.	54.	104.	1.	104.	0.2429	0.2454	0.7160	0.7189	0.6089
640	313.	51.	57.	107.	0.	108.	0.2453	0.2470	0.7164	0.7183	0.6111
660	321.	52.	59.	111.	0.	111.	0.2476	0.2487	0.7168	0.7181	0.6122
680	328.	53.	61.	114.	0.	115.	0.2498	0.2506	0.7168	0.7177	0.6131
700	335.	54.	64.	118.	0.	118.	0.2520	0.2525	0.7172	0.7178	0.6143
720	342.	55.	66.	121.	0.	121.	0.2540	0.2544	0.7175	0.7179	0.6153
740	350.	57.	68.	125.	0.	125.	0.2559	0.2562	0.7174	0.7178	0.6161
760	356.	58.	70.	128.	0.	128.	0.2578	0.2580	0.7177	0.7180	0.6162
780	363.	59.	72.	131.	0.	131.	0.2595	0.2597	0.7180	0.7182	0.6192
800	370.	60.	75.	135.	0.	135.	0.2612	0.2613	0.7182	0.7184	
820	377.	61.	77.	138.	0.	138.	0.2628	0.2629	0.7185	0.7186	
840	383.	62.	79.	141.	0.	141.	0.2643	0.2644	0.7183	0.7184	
860	390.	63.	81.	144.	0.	144.	0.2657	0.2658	0.7185	0.7186	
880	397.	64.	83.	147.	0.	147.	0.2671	0.2671	0.7187	0.7188	
900	403.	65.	85.	151.	0.	151.	0.2684	0.2684	0.7185	0.7186	
920	409.	66.	87.	154.	0.	154.	0.2697	0.2697	0.7187	0.7188	
940	416.	67.	89.	157.	0.	157.	0.2709	0.2709	0.7189	0.7189	
960	422.	68.	91.	160.	0.	160.	0.2720	0.2721	0.7187	0.7187	
980	428.	69.	93.	163.	0.	163.	0.2732	0.2732	0.7188	0.7189	
1000	434.	70.	95.	166.	0.	166.	0.2743	0.2744	0.7190	0.7190	
1020	440.	71.	97.	169.	0.	169.	0.2752	0.2752	0.7187	0.7187	
1040	446.	72.	99.	171.	0.	171.	0.2761	0.2761	0.7188	0.7188	
1060	452.	73.	101.	174.	0.	174.	0.2769	0.2769	0.7189	0.7190	
1080	458.	74.	103.	177.	0.	177.	0.2777	0.2777	0.7190	0.7191	
1100	464.	75.	104.	180.	0.	180.	0.2785	0.2785	0.7192	0.7192	
1120	470.	76.	106.	182.	0.	182.	0.2793	0.2793	0.7192	0.7193	
1140	475.	77.	108.	185.	0.	185.	0.2800	0.2800	0.7190	0.7190	
1160	481.	78.	110.	188.	0.	188.	0.2808	0.2808	0.7191	0.7191	
1180	487.	79.	112.	191.	0.	191.	0.2815	0.2815	0.7191	0.7192	
1200	492.	80.	113.	193.	0.	193.	0.2822	0.2822	0.7192	0.7192	
1220	498.	81.	115.	196.	0.	196.	0.2829	0.2829	0.7193	0.7193	
1240	503.	82.	117.	199.	0.	199.	0.2836	0.2836	0.7190	0.7190	
1260	509.	82.	119.	201.	0.	201.	0.2842	0.2842	0.7191	0.7191	
1280	515.	83.	120.	204.	0.	204.	0.2849	0.2849	0.7192	0.7192	

TABLE IV. - Continued. TRANSPORT PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

(a) Concluded. NO_2-N_2O_4 system

Temperature, ^oK	Viscosity, poises	Thermal conductivity, cal/(cm)(sec)(^oK)					Heat capacity, c_p, cal/(g)(^oK)		Prandtl number		Lewis number
		Monatomic	Internal	Frozen	Reaction	Equilibrium	Frozen	Equilibrium	Frozen	Equilibrium	
Pressure, 100 atm											
300	123.X10-6	10.X10-6	24.X10-5	34.X10-5	31.X10-6	65.X10-6	0.2012	0.3170	0.7288	0.6018	1.5780
320	132.	11.	26.	37.	57.	95.	0.2072	0.4144	0.7310	0.5781	1.5292
340	143.	13.	29.	41.	97.	138.	0.2125	0.5541	0.7327	0.5729	1.4525
360	155.	15.	31.	46.	148.	194.	0.2172	0.7383	0.7350	0.5904	1.3468
380	169.	18.	33.	51.	203.	254.	0.2208	0.9530	0.7366	0.6326	1.2139
400	184.	21.	35.	56.	248.	304.	0.2234	1.1526	0.7371	0.6979	1.0697
420	200.	25.	36.	61.	262.	323.	0.2249	1.2580	0.7356	0.7793	0.9317
440	216.	29.	37.	67.	236.	303.	0.2258	1.2055	0.7317	0.8580	0.8190
460	230.	33.	38.	72.	184.	256.	0.2266	1.0176	0.7272	0.9135	0.7376
480	242.	37.	40.	76.	129.	205.	0.2277	0.7887	0.7232	0.9321	0.6849
500	253.	39.	41.	81.	84.	165.	0.2293	0.5956	0.7202	0.9153	0.6535
520	263.	41.	43.	85.	54.	138.	0.2313	0.4611	0.7184	0.8780	0.5352
540	273.	43.	45.	89.	34.	123.	0.2335	0.3762	0.7174	0.8364	0.6249
560	281.	45.	48.	93.	22.	114.	0.2359	0.3250	0.7169	0.8005	0.6192
580	289.	47.	50.	96.	14.	110.	0.2383	0.2949	0.7167	0.7737	0.6162
600	298.	48.	52.	100.	9.	109.	0.2408	0.2774	0.7165	0.7549	0.6144
620	305.	49.	54.	104.	6.	110.	0.2432	0.2674	0.7166	0.7426	0.6138
640	313.	51.	57.	107.	4.	112.	0.2455	0.2618	0.7169	0.7346	0.6138
660	321.	52.	59.	111.	3.	114.	0.2478	0.2590	0.7171	0.7294	0.6142
680	328.	53.	61.	114.	2.	117.	0.2499	0.2579	0.7171	0.7257	0.6139
700	335.	54.	64.	118.	2.	119.	0.2520	0.2577	0.7174	0.7235	0.6152
720	342.	55.	66.	121.	1.	122.	0.2541	0.2582	0.7176	0.7221	0.6160
740	349.	57.	68.	125.	1.	126.	0.2560	0.2590	0.7176	0.7208	0.6164
760	356.	58.	70.	128.	1.	129.	0.2578	0.2601	0.7178	0.7202	0.6172
780	363.	59.	73.	131.	1.	132.	0.2596	0.2613	0.7181	0.7199	0.6185
800	370.	60.	75.	135.	0.	135.	0.2612	0.2625	0.7183	0.7197	0.6192
820	377.	61.	77.	138.	0.	138.	0.2628	0.2638	0.7185	0.7196	0.6202
840	383.	62.	79.	141.	0.	141.	0.2643	0.2651	0.7184	0.7192	0.6204
860	390.	63.	81.	144.	0.	144.	0.2657	0.2664	0.7186	0.7192	0.6216
880	397.	64.	83.	147.	0.	148.	0.2671	0.2676	0.7188	0.7193	0.6224
900	403.	65.	85.	151.	0.	151.	0.2684	0.2688	0.7186	0.7190	
920	409.	66.	87.	154.	0.	154.	0.2697	0.2700	0.7187	0.7191	
940	416.	67.	89.	157.	0.	157.	0.2709	0.2712	0.7189	0.7192	
960	422.	68.	91.	160.	0.	160.	0.2721	0.2723	0.7187	0.7189	
980	428.	69.	93.	163.	0.	163.	0.2732	0.2734	0.7189	0.7191	
1000	434.	70.	95.	166.	0.	166.	0.2743	0.2745	0.7190	0.7192	
1020	440.	71.	97.	169.	0.	169.	0.2752	0.2754	0.7187	0.7189	
1040	446.	72.	99.	171.	0.	171.	0.2761	0.2762	0.7188	0.7190	
1060	452.	73.	101.	174.	0.	174.	0.2769	0.2770	0.7190	0.7191	
1080	458.	74.	103.	177.	0.	177.	0.2777	0.2778	0.7191	0.7191	
1100	464.	75.	104.	180.	0.	180.	0.2785	0.2786	0.7192	0.7192	
1120	470.	76.	106.	182.	0.	182.	0.2793	0.2793	0.7193	0.7193	
1140	475.	77.	108.	185.	0.	185.	0.2800	0.2801	0.7190	0.7190	
1160	481.	78.	110.	188.	0.	188.	0.2808	0.2808	0.7191	0.7191	
1180	487.	79.	112.	191.	0.	191.	0.2815	0.2815	0.7192	0.7192	
1200	492.	80.	113.	193.	0.	193.	0.2822	0.2822	0.7192	0.7193	
1220	498.	81.	115.	195.	0.	196.	0.2829	0.2829	0.7193	0.7194	
1240	503.	82.	117.	199.	0.	199.	0.2836	0.2836	0.7190	0.7191	
1260	509.	82.	119.	201.	0.	201.	0.2842	0.2842	0.7191	0.7191	
1280	515.	83.	120.	204.	0.	204.	0.2849	0.2849	0.7192	0.7192	

TABLE IV. - Continued. TRANSPORT PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

(b) NO_2-N_2O_4-NO-O_2 system

Temperature, °K	Viscosity, poises	Thermal conductivity, cal/(cm)(sec)(°K)					Heat capacity, c_p, cal/(g)(°K)		Prandtl number		Lewis number
		Monatomic	Internal	Frozen	Reaction	Equilibrium	Frozen	Equilibrium	Frozen	Equilibrium	
Pressure, 0.01 atm											
300	162.X10-6	25.X10-6	19.X10-6	44.X10-6	143.X10-6	187.X10-6	0.1941	1.1871	0.7089	1.0255	0.6309
320	174.	28.	21.	49.	44.	92.	0.1970	0.4767	0.7068	0.8996	0.6348
340	185.	30.	22.	52.	23.	75.	0.2003	0.3064	0.7071	0.7552	0.8159
360	195.	32.	24.	56.	27.	83.	0.2038	0.2934	0.7078	0.6880	1.0942
380	205.	33.	27.	60.	44.	104.	0.2073	0.3352	0.7087	0.6581	1.2014
400	215.	35.	29.	64.	74.	138.	0.2109	0.4122	0.7092	0.6417	1.2154
420	225.	37.	31.	68.	118.	186.	0.2145	0.5231	0.7096	0.6334	1.2041
440	235.	39.	33.	72.	177.	249.	0.2182	0.6691	0.7099	0.6320	1.1829
460	245.	42.	35.	77.	249.	326.	0.2218	0.8476	0.7100	0.6374	1.1542
480	256.	45.	36.	81.	332.	413.	0.2255	1.0488	0.7099	0.6498	1.1178
500	267.	48.	38.	86.	414.	500.	0.2290	1.2536	0.7095	0.6682	1.0755
520	278.	52.	39.	91.	484.	575.	0.2324	1.4338	0.7088	0.6922	1.0286
540	288.	56.	40.	95.	528.	624.	0.2357	1.5575	0.7078	0.7195	0.9808
560	299.	60.	41.	101.	539.	640.	0.2386	1.5999	0.7067	0.7485	0.9344
580	310.	65.	41.	105.	514.	620.	0.2413	1.5540	0.7053	0.7758	0.8925
600	319.	69.	42.	111.	463.	574.	0.2436	1.4343	0.7039	0.7988	0.8570
620	329.	73.	42.	115.	397.	512.	0.2456	1.2701	0.7026	0.8154	0.8284
640	338.	76.	43.	119.	328.	447.	0.2475	1.0923	0.7014	0.8253	0.8058
660	346.	79.	44.	123.	263.	386.	0.2491	0.9245	0.7004	0.8285	0.7884
680	354.	82.	44.	127.	208.	334.	0.2506	0.7794	0.6996	0.8252	0.7757
700	362.	85.	45.	130.	162.	293.	0.2520	0.6609	0.6990	0.8173	0.7661
720	369.	87.	47.	134.	126.	260.	0.2533	0.5677	0.6986	0.8060	0.7593
740	377.	90.	48.	137.	98.	235.	0.2546	0.4960	0.6983	0.7932	0.7541
760	384.	92.	49.	141.	77.	217.	0.2558	0.4416	0.6980	0.7799	0.7506
780	391.	94.	50.	144.	60.	204.	0.2569	0.4006	0.6979	0.7674	0.7477
800	398.	96.	51.	147.	47.	194.	0.2580	0.3698	0.6979	0.7560	0.7455
820	404.	97.	53.	150.	38.	188.	0.2591	0.3466	0.6978	0.7460	0.7441
840	411.	99.	54.	153.	30.	183.	0.2602	0.3292	0.6978	0.7376	0.7430
860	418.	101.	55.	156.	24.	181.	0.2611	0.3160	0.6978	0.7305	0.7426
880	424.	103.	57.	159.	20.	179.	0.2621	0.3061	0.6978	0.7246	0.7422
900	430.	104.	58.	162.	16.	178.	0.2630	0.2985	0.6979	0.7200	0.7419
920	437.	106.	59.	165.	13.	179.	0.2639	0.2928	0.6978	0.7160	0.7419
940	443.	107.	61.	168.	11.	179.	0.2648	0.2884	0.6979	0.7129	0.7420
960	449.	109.	62.	171.	9.	180.	0.2656	0.2851	0.6980	0.7105	0.7421
980	456.	110.	63.	174.	8.	182.	0.2664	0.2825	0.6979	0.7083	0.7424
1000	462.	112.	65.	177.	7.	183.	0.2672	0.2806	0.6980	0.7068	0.7425
1020	468.	113.	66.	179.	6.	185.	0.2678	0.2791	0.6980	0.7053	0.7429
1040	474.	115.	67.	182.	5.	187.	0.2685	0.2780	0.6981	0.7043	0.7431
1060	480.	116.	69.	185.	4.	189.	0.2691	0.2772	0.6981	0.7034	0.7437
1080	486.	118.	70.	188.	4.	191.	0.2697	0.2767	0.6982	0.7027	0.7440
1100	491.	119.	71.	190.	3.	193.	0.2704	0.2763	0.6982	0.7020	0.7443
1120	497.	121.	72.	193.	3.	196.	0.2710	0.2761	0.6982	0.7016	0.7446
1140	503.	122.	74.	196.	2.	198.	0.2716	0.2760	0.6983	0.7012	0.7453
1160	509.	123.	75.	198.	2.	200.	0.2721	0.2760	0.6984	0.7009	0.7456
1180	514.	125.	76.	201.	2.	203.	0.2727	0.2761	0.6984	0.7006	0.7459
1200	520.	126.	77.	203.	2.	205.	0.2733	0.2762	0.6985	0.7004	0.7462
1220	526.	128.	78.	206.	1.	207.	0.2738	0.2764	0.6986	0.7003	0.7468
1240	531.	129.	80.	209.	1.	210.	0.2744	0.2767	0.6986	0.7000	0.7471
1260	537.	130.	81.	211.	1.	212.	0.2749	0.2769	0.6987	0.7000	0.7473
1280	542.	132.	82.	214.	1.	215.	0.2754	0.2772	0.6986	0.6998	0.7474

TABLE IV. - Continued. TRANSPORT PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

(b) Continued. NO_2-N_2O_4-NO-O_2 system

Temper-ature, ^oK	Viscosity, poises	Thermal conductivity, cal/(cm)(sec)(^oK)					Heat capacity, c_p, cal/(g)(^oK)		Prandtl number		Lewis number
		Monatomic	Internal	Frozen	Reaction	Equilibrium	Frozen	Equilibrium	Frozen	Equilibrium	
		Pressure, 0.03 atm									
300	157.X10-6	23.X10-6	20.X10-6	43.X10-6	280.X10-6	323.X10-6	0.1952	2.0109	0.7142	0.9783	0.7011
320	173.	27.	21.	48.	105.	153.	0.1975	0.8835	0.7091	0.9984	0.6268
340	185.	30.	23.	52.	39.	91.	0.2005	0.4248	0.7079	0.8583	0.6680
360	195.	32.	25.	56.	26.	82.	0.2038	0.3123	0.7082	0.7389	0.8801
380	205.	33.	27.	60.	34.	94.	0.2073	0.3118	0.7089	0.6828	1.1139
400	215.	35.	29.	64.	53.	117.	0.2108	0.3570	0.7094	0.6564	1.1973
420	224.	37.	31.	68.	84.	151.	0.2143	0.4333	0.7099	0.6423	1.2082
440	234.	39.	33.	72.	126.	198.	0.2178	0.5384	0.7103	0.6356	1.1973
460	244.	41.	35.	76.	182.	258.	0.2213	0.6713	0.7106	0.6351	1.1771
480	254.	44.	37.	80.	248.	328.	0.2248	0.8284	0.7107	0.6408	1.1496
500	264.	47.	38.	85.	321.	406.	0.2283	1.0010	0.7106	0.6522	1.1161
520	275.	50.	40.	90.	393.	482.	0.2316	1.1740	0.7102	0.6690	1.0769
540	285.	53.	41.	94.	454.	549.	0.2348	1.3267	0.7097	0.6901	1.0345
560	296.	57.	42.	99.	496.	595.	0.2378	1.4365	0.7089	0.7146	0.9903
580	306.	61.	43.	104.	510.	614.	0.2405	1.4852	0.7078	0.7404	0.9474
600	316.	65.	43.	109.	497.	606.	0.2430	1.4656	0.7066	0.7653	0.9080
620	326.	69.	44.	113.	460.	574.	0.2452	1.3846	0.7052	0.7869	0.8738
640	335.	73.	45.	118.	408.	526.	0.2472	1.2603	0.7039	0.8042	0.8448
660	344.	77.	45.	122.	348.	470.	0.2489	1.1152	0.7027	0.8152	0.8210
680	353.	80.	46.	126.	290.	415.	0.2505	0.9688	0.7016	0.8220	0.8024
700	361.	83.	47.	130.	236.	366.	0.2520	0.8345	0.7007	0.8225	0.7879
720	368.	86.	48.	133.	190.	323.	0.2534	0.7187	0.7001	0.8182	0.7770
740	376.	88.	49.	137.	152.	289.	0.2546	0.6232	0.6995	0.8105	0.7684
760	383.	91.	50.	140.	121.	262.	0.2558	0.5465	0.6990	0.8003	0.7621
780	390.	93.	51.	143.	97.	240.	0.2570	0.4861	0.6988	0.7891	0.7571
800	397.	95.	52.	147.	77.	224.	0.2581	0.4391	0.6986	0.7777	0.7532
820	404.	97.	53.	150.	62.	212.	0.2592	0.4026	0.6984	0.7665	0.7505
840	411.	99.	54.	153.	50.	203.	0.2602	0.3745	0.6983	0.7564	0.7483
860	417.	100.	56.	156.	41.	197.	0.2612	0.3527	0.6982	0.7473	0.7470
880	424.	102.	57.	159.	33.	193.	0.2622	0.3359	0.6981	0.7394	0.7458
900	430.	104.	58.	162.	27.	190.	0.2631	0.3229	0.6982	0.7328	0.7450
920	437.	105.	60.	165.	23.	188.	0.2640	0.3128	0.6980	0.7270	0.7446
940	443.	107.	61.	168.	19.	187.	0.2648	0.3049	0.6981	0.7224	0.7443
960	449.	109.	62.	171.	16.	187.	0.2656	0.2988	0.6982	0.7186	0.7440
980	455.	110.	64.	174.	13.	187.	0.2664	0.2940	0.6981	0.7152	0.7441
1000	462.	112.	65.	177.	11.	188.	0.2672	0.2902	0.6982	0.7126	0.7440
1020	468.	113.	66.	179.	10.	189.	0.2679	0.2872	0.6981	0.7104	0.7441
1040	474.	115.	67.	182.	8.	190.	0.2685	0.2849	0.6982	0.7086	0.7442
1060	480.	116.	69.	185.	7.	192.	0.2691	0.2831	0.6982	0.7071	0.7447
1080	485.	118.	70.	188.	6.	194.	0.2698	0.2817	0.6983	0.7059	0.7448
1100	491.	119.	71.	190.	5.	196.	0.2704	0.2806	0.6983	0.7048	0.7451
1120	497.	121.	72.	193.	5.	198.	0.2710	0.2798	0.6983	0.7040	0.7452
1140	503.	122.	74.	196.	4.	200.	0.2716	0.2792	0.6984	0.7033	0.7459
1160	509.	123.	75.	198.	4.	202.	0.2722	0.2788	0.6985	0.7027	0.7461
1180	514.	125.	76.	201.	3.	204.	0.2727	0.2785	0.6985	0.7022	0.7464
1200	520.	126.	77.	203.	3.	206.	0.2733	0.2784	0.6986	0.7018	0.7466
1220	526.	128.	78.	206.	3.	209.	0.2738	0.2783	0.6987	0.7015	0.7472
1240	531.	129.	80.	209.	2.	211.	0.2744	0.2783	0.6986	0.7011	0.7475
1260	537.	130.	81.	211.	2.	213.	0.2749	0.2784	0.6987	0.7009	0.7477
1280	542.	132.	82.	214.	2.	216.	0.2754	0.2785	0.6987	0.7006	0.7477

TABLE IV. - Continued. TRANSPORT PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

(b) Continued. NO_2-N_2O_4-NO-O_2 system

Temperature, ^oK	Viscosity, poises	Thermal conductivity, cal/(cm)(sec)(^oK)					Heat capacity, c_p, cal/(g)(^oK)		Prandtl number		Lewis number
		Monatomic	Internal	Frozen	Reaction	Equilibrium	Frozen	Equilibrium	Frozen	Equilibrium	
					Pressure, 0.1 atm						
300	149.X10-6	20.X10-6	21.X10-6	41.X10-6	383.X10-6	423.X10-6	0.1969	2.3729	0.7219	0.8328	0.8547
320	168.	25.	22.	47.	234.	281.	0.1989	1.6518	0.7147	0.9891	0.6846
340	183.	29.	23.	52.	96.	147.	0.2012	0.7867	0.7103	0.9756	0.6347
360	194.	31.	25.	56.	42.	98.	0.2041	0.4274	0.7091	0.8458	0.6909
380	205.	33.	27.	60.	32.	91.	0.2073	0.3299	0.7093	0.7388	0.8927
400	214.	35.	29.	64.	39.	103.	0.2107	0.3287	0.7097	0.6848	1.1012
420	224.	37.	31.	67.	58.	126.	0.2141	0.3701	0.7102	0.6589	1.1848
440	233.	38.	33.	71.	87.	159.	0.2175	0.4390	0.7106	0.6454	1.2005
460	243.	40.	35.	75.	127.	202.	0.2209	0.5316	0.7110	0.6390	1.1928
480	253.	43.	37.	80.	176.	255.	0.2243	0.6458	0.7113	0.6385	1.1747
500	262.	45.	39.	84.	233.	317.	0.2277	0.7778	0.7114	0.6430	1.1504
520	272.	48.	41.	88.	296.	384.	0.2309	0.9210	0.7114	0.6527	1.1201
540	282.	51.	42.	93.	358.	451.	0.2340	1.0648	0.7112	0.6666	1.0857
560	293.	54.	43.	98.	413.	511.	0.2370	1.1952	0.7108	0.6847	1.0475
580	303.	58.	44.	102.	454.	557.	0.2398	1.2970	0.7101	0.7056	1.0078
600	313.	62.	45.	107.	476.	583.	0.2424	1.3565	0.7092	0.7279	0.9686
620	323.	65.	46.	112.	476.	588.	0.2447	1.3663	0.7080	0.7500	0.9318
640	332.	69.	47.	116.	456.	572.	0.2468	1.3268	0.7069	0.7707	0.8982
660	341.	73.	47.	120.	419.	540.	0.2487	1.2468	0.7057	0.7887	0.8685
680	350.	77.	48.	124.	373.	498.	0.2504	1.1402	0.7044	0.8023	0.8436
700	359.	80.	48.	128.	323.	451.	0.2520	1.0216	0.7033	0.8115	0.8229
720	367.	83.	49.	132.	274.	406.	0.2534	0.9036	0.7023	0.8160	0.8064
740	374.	86.	50.	136.	228.	364.	0.2547	0.7944	0.7014	0.8163	0.7929
760	382.	89.	51.	139.	189.	328.	0.2560	0.6985	0.7007	0.8127	0.7825
780	389.	91.	52.	143.	155.	298.	0.2571	0.6173	0.7002	0.8066	0.7740
800	396.	93.	53.	146.	127.	273.	0.2583	0.5502	0.6998	0.7984	0.7672
820	403.	95.	54.	150.	104.	253.	0.2593	0.4956	0.6994	0.7889	0.7621
840	410.	98.	55.	153.	85.	238.	0.2604	0.4518	0.6992	0.7791	0.7580
860	417.	99.	56.	156.	70.	226.	0.2613	0.4168	0.6990	0.7693	0.7552
880	423.	101.	58.	159.	58.	217.	0.2623	0.3890	0.6988	0.7600	0.7528
900	430.	103.	59.	162.	48.	210.	0.2632	0.3669	0.6987	0.7517	0.7509
920	436.	105.	60.	165.	40.	205.	0.2641	0.3494	0.6985	0.7440	0.7496
940	443.	107.	61.	168.	33.	201.	0.2649	0.3354	0.6985	0.7375	0.7486
960	449.	108.	63.	171.	28.	199.	0.2657	0.3243	0.6985	0.7319	0.7477
980	455.	110.	64.	174.	24.	198.	0.2665	0.3154	0.6984	0.7269	0.7473
1000	461.	111.	65.	177.	20.	197.	0.2673	0.3083	0.6984	0.7228	0.7468
1020	468.	113.	66.	179.	17.	197.	0.2679	0.3026	0.6984	0.7192	0.7466
1040	474.	114.	68.	182.	15.	197.	0.2686	0.2979	0.6984	0.7163	0.7463
1060	479.	116.	69.	185.	13.	198.	0.2692	0.2942	0.6984	0.7138	0.7466
1080	485.	117.	70.	188.	11.	199.	0.2698	0.2912	0.6984	0.7117	0.7465
1100	491.	119.	71.	190.	10.	200.	0.2704	0.2888	0.6984	0.7099	0.7466
1120	497.	120.	72.	193.	8.	201.	0.2710	0.2869	0.6985	0.7084	0.7466
1140	503.	122.	74.	196.	7.	203.	0.2716	0.2854	0.6985	0.7072	0.7471
1160	509.	123.	75.	198.	7.	205.	0.2722	0.2842	0.6986	0.7062	0.7472
1180	514.	125.	76.	201.	6.	207.	0.2728	0.2833	0.6986	0.7052	0.7474
1200	520.	126.	77.	203.	5.	209.	0.2733	0.2825	0.6987	0.7045	0.7475
1220	526.	127.	79.	206.	5.	211.	0.2739	0.2820	0.6987	0.7038	0.7480
1240	531.	129.	80.	209.	4.	213.	0.2744	0.2816	0.6987	0.7032	0.7482
1260	537.	130.	81.	211.	4.	215.	0.2749	0.2813	0.6988	0.7028	0.7483
1280	542.	132.	82.	214.	3.	217.	0.2755	0.2811	0.6987	0.7023	0.7483

TABLE IV. - Continued. TRANSPORT PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

(b) Continued. NO_2-N_2O_4-NO-O_2 system

Temperature, °K	Viscosity, poises	Thermal conductivity, cal/(cm)(sec)(°K)					Heat capacity, c_p, cal/(g)(°K)		Prandtl number		Lewis number
		Monatomic	Internal	Frozen	Reaction	Equilibrium	Frozen	Equilibrium	Frozen	Equilibrium	
Pressure, 0.3 atm											
300	140.X10-6	16.X10-6	22.X10-6	38.X10-6	350.X10-6	388.X10-6	0.1985	1.9411	0.7269	0.6997	1.0433
320	161.	22.	23.	45.	344.	389.	0.2010	2.1142	0.7223	0.8747	0.8074
340	179.	27.	24.	51.	202.	252.	0.2026	1.3939	0.7154	0.9880	0.6772
360	193.	30.	25.	55.	91.	146.	0.2047	0.7241	0.7116	0.9543	0.6454
380	204.	33.	27.	60.	46.	106.	0.2076	0.4341	0.7104	0.8358	0.7125
400	214.	35.	29.	63.	37.	101.	0.2108	0.3477	0.7102	0.7391	0.9009
420	223.	36.	31.	67.	45.	112.	0.2141	0.3453	0.7105	0.6875	1.0880
440	233.	38.	33.	71.	63.	135.	0.2174	0.3823	0.7109	0.6618	1.1720
460	242.	40.	35.	75.	91.	166.	0.2207	0.4442	0.7114	0.6485	1.1925
480	252.	42.	37.	79.	127.	206.	0.2240	0.5257	0.7117	0.6425	1.1877
500	261.	44.	39.	83.	171.	254.	0.2273	0.6242	0.7120	0.6417	1.1724
520	271.	46.	41.	88.	221.	309.	0.2304	0.7360	0.7121	0.6455	1.1502
540	280.	49.	43.	92.	275.	367.	0.2335	0.8560	0.7122	0.6535	1.1235
560	290.	52.	44.	96.	329.	426.	0.2365	0.9763	0.7120	0.6655	1.0922
580	300.	55.	46.	101.	378.	479.	0.2393	1.0874	0.7117	0.6809	1.0581
600	310.	58.	47.	105.	417.	523.	0.2419	1.1787	0.7111	0.6986	1.0224
620	319.	62.	48.	110.	442.	552.	0.2443	1.2404	0.7103	0.7178	0.9870
640	329.	66.	49.	114.	450.	565.	0.2465	1.2660	0.7094	0.7376	0.9526
660	338.	69.	49.	119.	442.	560.	0.2485	1.2536	0.7084	0.7568	0.9202
680	347.	73.	50.	123.	419.	542.	0.2503	1.2068	0.7071	0.7739	0.8912
700	356.	77.	51.	127.	385.	512.	0.2520	1.1333	0.7060	0.7884	0.8656
720	364.	80.	51.	131.	344.	476.	0.2535	1.0431	0.7049	0.7993	0.8440
740	372.	83.	52.	135.	302.	437.	0.2549	0.9459	0.7038	0.8067	0.8255
760	380.	86.	53.	139.	260.	399.	0.2561	0.8498	0.7029	0.8102	0.8104
780	388.	89.	53.	142.	222.	364.	0.2573	0.7602	0.7022	0.8106	0.7978
800	395.	91.	54.	146.	187.	333.	0.2585	0.6801	0.7015	0.8080	0.7875
820	402.	94.	55.	149.	157.	306.	0.2595	0.6107	0.7009	0.8028	0.7793
840	409.	96.	56.	152.	132.	284.	0.2605	0.5519	0.7005	0.7961	0.7726
860	416.	98.	57.	155.	110.	266.	0.2615	0.5029	0.7001	0.7880	0.7676
880	423.	100.	58.	159.	92.	251.	0.2624	0.4625	0.6998	0.7796	0.7633
900	429.	102.	60.	162.	77.	239.	0.2633	0.4293	0.6996	0.7712	0.7599
920	436.	104.	61.	165.	65.	230.	0.2642	0.4022	0.6993	0.7628	0.7573
940	442.	106.	62.	168.	55.	223.	0.2650	0.3802	0.6992	0.7551	0.7553
960	449.	108.	63.	171.	47.	217.	0.2658	0.3623	0.6991	0.7482	0.7535
980	455.	109.	64.	174.	40.	213.	0.2666	0.3477	0.6989	0.7417	0.7524
1000	461.	111.	66.	176.	34.	210.	0.2674	0.3358	0.6989	0.7362	0.7512
1020	467.	112.	67.	179.	29.	208.	0.2680	0.3260	0.6988	0.7312	0.7504
1040	473.	114.	68.	182.	25.	207.	0.2686	0.3180	0.6988	0.7270	0.7498
1060	479.	116.	69.	185.	22.	206.	0.2693	0.3115	0.6987	0.7232	0.7496
1080	485.	117.	70.	187.	19.	206.	0.2699	0.3061	0.6987	0.7201	0.7492
1100	491.	119.	71.	190.	16.	207.	0.2705	0.3017	0.6987	0.7173	0.7490
1120	497.	120.	73.	193.	14.	207.	0.2711	0.2981	0.6987	0.7150	0.7487
1140	503.	122.	74.	195.	13.	208.	0.2717	0.2952	0.6987	0.7130	0.7491
1160	508.	123.	75.	198.	11.	209.	0.2722	0.2927	0.6988	0.7113	0.7489
1180	514.	124.	76.	201.	10.	211.	0.2728	0.2907	0.6987	0.7097	0.7489
1200	520.	126.	77.	203.	9.	212.	0.2734	0.2891	0.6988	0.7085	0.7489
1220	525.	127.	79.	206.	8.	214.	0.2739	0.2878	0.6989	0.7074	0.7493
1240	531.	129.	80.	209.	7.	216.	0.2744	0.2867	0.6988	0.7064	0.7494
1260	537.	130.	81.	211.	6.	217.	0.2750	0.2859	0.6989	0.7056	0.7494
1280	542.	131.	82.	214.	6.	219.	0.2755	0.2852	0.6988	0.7049	0.7493

TABLE IV. - Continued. TRANSPORT PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

(b) Continued. NO_2-N_2O_4-NO-O_2 system

Temperature, °K	Viscosity, poises	Thermal conductivity, cal/(cm)(sec)(°K)					Heat capacity, c_p, cal/(g)(°K)		Prandtl number		Lewis number
		Monatomic	Internal	Frozen	Reaction	Equilibrium	Frozen	Equilibrium	Frozen	Equilibrium	
					Pressure, 1 atm						
300	133.X10-6	14.X10-6	23.X10-6	36.X10-6	246.X10-6	283.X10-6	0.1997	1.2907	0.7291	0.6053	1.2420
320	151.	18.	24.	42.	341.	383.	0.2034	1.8396	0.7289	0.7253	1.0056
340	171.	23.	25.	48.	320.	368.	0.2053	1.8917	0.7239	0.8782	0.8029
360	188.	28.	26.	54.	200.	254.	0.2066	1.3147	0.7176	0.9731	0.6884
380	202.	32.	27.	59.	102.	161.	0.2086	0.7555	0.7135	0.9488	0.6575
400	213.	34.	29.	63.	57.	120.	0.2112	0.4766	0.7118	0.8478	0.7120
420	223.	36.	31.	67.	44.	111.	0.2142	0.3774	0.7113	0.7548	0.8669
440	232.	38.	33.	71.	49.	120.	0.2174	0.3622	0.7114	0.6991	1.0442
460	242.	40.	35.	75.	65.	140.	0.2206	0.3878	0.7118	0.6699	1.1449
480	251.	41.	37.	79.	89.	168.	0.2238	0.4373	0.7121	0.6548	1.1792
500	260.	43.	40.	83.	120.	202.	0.2270	0.5040	0.7125	0.6475	1.1826
520	269.	45.	42.	87.	157.	244.	0.2301	0.5843	0.7127	0.6455	1.1718
540	279.	48.	43.	91.	199.	290.	0.2331	0.6750	0.7129	0.6476	1.1541
560	288.	50.	45.	95.	245.	340.	0.2360	0.7721	0.7130	0.6536	1.1309
580	297.	53.	47.	100.	291.	390.	0.2388	0.8705	0.7130	0.6629	1.1040
600	307.	56.	48.	104.	334.	438.	0.2414	0.9640	0.7126	0.6749	1.0745
620	316.	59.	50.	108.	371.	480.	0.2439	1.0457	0.7122	0.6891	1.0437
640	326.	62.	51.	113.	399.	512.	0.2462	1.1089	0.7117	0.7051	1.0120
660	335.	65.	52.	117.	415.	532.	0.2483	1.1482	0.7110	0.7222	0.9802
680	344.	69.	52.	121.	419.	540.	0.2502	1.1605	0.7100	0.7390	0.9499
700	353.	72.	53.	125.	410.	535.	0.2520	1.1459	0.7090	0.7552	0.9216
720	361.	76.	54.	129.	390.	520.	0.2536	1.1072	0.7080	0.7697	0.8960
740	370.	79.	54.	133.	363.	496.	0.2550	1.0498	0.7068	0.7822	0.8728
760	378.	82.	55.	137.	330.	468.	0.2564	0.9799	0.7058	0.7918	0.8528
780	386.	85.	56.	141.	295.	436.	0.2576	0.9038	0.7049	0.7990	0.8354
800	393.	88.	56.	145.	260.	405.	0.2588	0.8270	0.7040	0.8032	0.8204
820	401.	91.	57.	148.	227.	375.	0.2598	0.7533	0.7032	0.8044	0.8080
840	408.	94.	58.	151.	197.	348.	0.2608	0.6855	0.7026	0.8034	0.7976
860	415.	96.	59.	155.	169.	324.	0.2618	0.6248	0.7020	0.7999	0.7892
880	422.	98.	60.	158.	145.	303.	0.2627	0.5716	0.7014	0.7950	0.7821
900	429.	100.	61.	161.	124.	286.	0.2636	0.5258	0.7011	0.7891	0.7762
920	435.	102.	62.	164.	107.	271.	0.2645	0.4868	0.7006	0.7822	0.7715
940	442.	104.	63.	167.	91.	259.	0.2653	0.4538	0.7003	0.7752	0.7676
960	448.	106.	64.	170.	78.	249.	0.2661	0.4262	0.7001	0.7682	0.7643
980	454.	108.	65.	173.	67.	241.	0.2668	0.4030	0.6998	0.7611	0.7618
1000	461.	110.	66.	176.	58.	234.	0.2676	0.3837	0.6997	0.7546	0.7595
1020	467.	112.	67.	179.	50.	229.	0.2682	0.3675	0.6995	0.7485	0.7578
1040	473.	113.	68.	182.	44.	225.	0.2688	0.3540	0.6994	0.7430	0.7562
1060	479.	115.	70.	185.	38.	222.	0.2694	0.3427	0.6992	0.7378	0.7553
1080	485.	116.	71.	187.	33.	220.	0.2700	0.3333	0.6992	0.7334	0.7543
1100	491.	118.	72.	190.	29.	219.	0.2706	0.3254	0.6991	0.7294	0.7536
1120	497.	120.	73.	193.	25.	218.	0.2712	0.3188	0.6991	0.7259	0.7528
1140	503.	121.	74.	195.	22.	218.	0.2718	0.3133	0.6991	0.7228	0.7528
1160	508.	123.	75.	198.	20.	218.	0.2723	0.3087	0.6991	0.7201	0.7523
1180	514.	124.	77.	201.	18.	218.	0.2729	0.3048	0.6990	0.7177	0.7520
1200	520.	125.	78.	203.	16.	219.	0.2734	0.3015	0.6991	0.7156	0.7517
1220	525.	127.	79.	206.	14.	220.	0.2740	0.2988	0.6991	0.7138	0.7518
1240	531.	128.	80.	209.	13.	221.	0.2745	0.2965	0.6990	0.7122	0.7517
1260	537.	130.	81.	211.	11.	222.	0.2750	0.2946	0.6991	0.7108	0.7515
1280	542.	131.	83.	214.	10.	224.	0.2755	0.2930	0.6990	0.7095	0.7512

TABLE IV. - Continued. TRANSPORT PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

(b) Continued. NO_2-N_2O_4-NO-O_2 system

Temperature, °K	Viscosity, poises	Thermal conductivity, cal/(cm)(sec)(°K)					Heat capacity, c_p, cal/(g)(°K)		Prandtl number		Lewis number
		Monatomic	Internal	Frozen	Reaction	Equilibrium	Frozen	Equilibrium	Frozen	Equilibrium	
Pressure, 3 atm											
300	128.X10-6	12.X10-6	23.X10-6	35.X10-6	159.X10-6	194.X10-6	0.2004	0.8562	0.7295	0.5647	1.3811
320	143.	15.	25.	40.	258.	298.	0.2051	1.3092	0.7315	0.6292	1.1926
340	161.	20.	26.	46.	327.	373.	0.2080	1.7175	0.7304	0.7436	0.9797
360	180.	25.	27.	52.	300.	352.	0.2095	1.7093	0.7257	0.8766	0.8039
380	197.	29.	28.	58.	200.	258.	0.2107	1.2521	0.7197	0.9578	0.7011
400	210.	33.	30.	62.	113.	175.	0.2124	0.7848	0.7154	0.9417	0.6705
420	222.	35.	31.	67.	68.	134.	0.2148	0.5200	0.7133	0.8580	0.7125
440	232.	37.	33.	71.	52.	123.	0.2177	0.4099	0.7125	0.7707	0.8390
460	241.	39.	35.	75.	55.	129.	0.2207	0.3818	0.7124	0.7124	1.0002
480	250.	41.	38.	79.	67.	146.	0.2238	0.3958	0.7126	0.6796	1.1117
500	259.	43.	40.	83.	87.	170.	0.2269	0.4339	0.7129	0.6619	1.1612
520	268.	45.	42.	85.	114.	200.	0.2299	0.4879	0.7132	0.6531	1.1738
540	277.	47.	44.	91.	146.	236.	0.2329	0.5534	0.7134	0.6497	1.1694
560	286.	49.	46.	95.	182.	276.	0.2357	0.6274	0.7136	0.6506	1.1553
580	295.	51.	48.	99.	220.	319.	0.2385	0.7066	0.7138	0.6548	1.1360
600	304.	54.	49.	103.	259.	362.	0.2411	0.7874	0.7136	0.6617	1.1129
620	314.	56.	51.	107.	297.	404.	0.2436	0.8656	0.7134	0.6710	1.0880
640	323.	59.	52.	111.	332.	443.	0.2459	0.9366	0.7132	0.6825	1.0609
660	332.	62.	53.	115.	359.	475.	0.2481	0.9958	0.7128	0.6959	1.0325
680	341.	65.	54.	120.	379.	499.	0.2501	1.0392	0.7121	0.7099	1.0040
700	350.	69.	55.	124.	389.	513.	0.2520	1.0639	0.7114	0.7247	0.9760
720	358.	72.	56.	128.	390.	518.	0.2537	1.0687	0.7106	0.7391	0.9494
740	367.	75.	57.	132.	382.	513.	0.2552	1.0542	0.7096	0.7530	0.9240
760	375.	78.	57.	136.	365.	501.	0.2566	1.0227	0.7086	0.7653	0.9010
780	383.	82.	58.	140.	343.	482.	0.2579	0.9776	0.7077	0.7763	0.8799
800	391.	85.	59.	143.	316.	460.	0.2591	0.9231	0.7068	0.7853	0.8611
820	399.	88.	59.	147.	288.	435.	0.2602	0.8633	0.7059	0.7917	0.8448
840	406.	90.	60.	150.	259.	409.	0.2612	0.8019	0.7051	0.7961	0.8305
860	413.	93.	61.	154.	230.	384.	0.2622	0.7417	0.7043	0.7979	0.8186
880	420.	96.	62.	157.	204.	361.	0.2631	0.6848	0.7036	0.7978	0.8082
900	427.	98.	62.	160.	179.	339.	0.2640	0.6324	0.7030	0.7961	0.7993
920	434.	100.	63.	164.	157.	320.	0.2648	0.5853	0.7023	0.7927	0.7919
940	441.	102.	64.	167.	137.	304.	0.2656	0.5435	0.7019	0.7883	0.7857
960	447.	105.	65.	170.	120.	289.	0.2664	0.5069	0.7016	0.7832	0.7803
980	454.	107.	66.	173.	104.	277.	0.2671	0.4751	0.7011	0.7773	0.7759
1000	460.	108.	67.	176.	91.	267.	0.2678	0.4478	0.7009	0.7715	0.7721
1020	466.	110.	68.	179.	80.	258.	0.2684	0.4242	0.7005	0.7655	0.7689
1040	472.	112.	69.	181.	70.	251.	0.2690	0.4041	0.7004	0.7597	0.7662
1060	479.	114.	70.	184.	61.	246.	0.2696	0.3870	0.7001	0.7540	0.7642
1080	485.	116.	72.	187.	54.	241.	0.2702	0.3723	0.7000	0.7488	0.7623
1100	490.	117.	73.	190.	47.	237.	0.2708	0.3599	0.6998	0.7439	0.7607
1120	496.	119.	74.	192.	42.	234.	0.2714	0.3493	0.6997	0.7394	0.7593
1140	502.	120.	75.	195.	37.	232.	0.2719	0.3402	0.6997	0.7353	0.7586
1160	508.	122.	76.	198.	33.	231.	0.2725	0.3325	0.6996	0.7317	0.7576
1180	514.	123.	77.	201.	29.	230.	0.2730	0.3260	0.6995	0.7283	0.7568
1200	519.	125.	78.	203.	26.	229.	0.2736	0.3204	0.6995	0.7254	0.7561
1220	525.	126.	79.	206.	24.	229.	0.2741	0.3156	0.6995	0.7227	0.7558
1240	531.	128.	81.	208.	21.	230.	0.2746	0.3115	0.6994	0.7203	0.7554
1260	536.	129.	82.	211.	19.	230.	0.2751	0.3080	0.6994	0.7182	0.7549
1280	542.	131.	83.	214.	17.	231.	0.2756	0.3050	0.6993	0.7163	0.7544

TABLE IV. - Continued. TRANSPORT PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

(b) Continued. NO_2-N_2O_4-NO-O_2 system

Temperature, °K	Viscosity, poises	Thermal conductivity, cal/(cm)(sec)(°K)					Heat capacity, c_p, cal/(g)(°K)		Prandtl number		Lewis number
		Monatomic	Internal	Frozen	Reaction	Equilibrium	Frozen	Equilibrium	Frozen	Equilibrium	
Pressure, 10 atm											
300	125.X10-6	11.X10-6	23.X10-6	34.X10-6	93.X10-6	127.X10-6	0.2009	0.5652	0.7293	0.5561	1.4831
320	138.	13.	26.	39.	164.	202.	0.2062	0.8474	0.7319	0.5764	1.3565
340	153.	16.	28.	44.	246.	290.	0.2103	1.2097	0.7332	0.6360	1.1849
360	170.	20.	29.	49.	304.	353.	0.2130	1.5277	0.7328	0.7343	0.9976
380	188.	25.	30.	55.	292.	347.	0.2144	1.5696	0.7289	0.8486	0.8366
400	204.	30.	31.	61.	219.	279.	0.2153	1.2722	0.7232	0.9297	0.7326
420	218.	34.	32.	66.	139.	205.	0.2167	0.8839	0.7185	0.9394	0.6884
440	230.	36.	34.	70.	88.	159.	0.2187	0.6103	0.7156	0.8829	0.7046
460	240.	38.	36.	74.	66.	140.	0.2213	0.4690	0.7142	0.8045	0.7876
480	249.	40.	38.	78.	61.	139.	0.2240	0.4138	0.7137	0.7404	0.9214
500	258.	42.	40.	82.	68.	150.	0.2269	0.4070	0.7136	0.6993	1.0465
520	267.	44.	42.	86.	83.	169.	0.2299	0.4278	0.7138	0.6756	1.1220
540	276.	46.	44.	90.	104.	194.	0.2327	0.4655	0.7140	0.6626	1.1550
560	285.	48.	46.	94.	129.	223.	0.2356	0.5145	0.7142	0.6565	1.1620
580	294.	50.	48.	98.	158.	256.	0.2383	0.5712	0.7144	0.6549	1.1559
600	303.	52.	50.	102.	190.	292.	0.2409	0.6328	0.7143	0.6564	1.1424
620	311.	54.	52.	106.	222.	328.	0.2434	0.6967	0.7144	0.6606	1.1252
640	320.	57.	53.	110.	255.	365.	0.2458	0.7601	0.7144	0.6671	1.1047
660	329.	59.	55.	114.	285.	399.	0.2480	0.8200	0.7143	0.6757	1.0818
680	338.	62.	56.	118.	312.	430.	0.2500	0.8735	0.7138	0.6855	1.0577
700	346.	65.	57.	122.	334.	456.	0.2520	0.9177	0.7134	0.6968	1.0328
720	355.	68.	58.	125.	349.	476.	0.2537	0.9503	0.7129	0.7087	1.0081
740	363.	71.	59.	130.	358.	489.	0.2554	0.9698	0.7122	0.7211	0.9832
760	372.	74.	60.	134.	360.	494.	0.2569	0.9755	0.7114	0.7333	0.9595
780	380.	77.	61.	138.	355.	493.	0.2582	0.9678	0.7107	0.7453	0.9367
800	388.	80.	62.	142.	344.	486.	0.2595	0.9477	0.7099	0.7564	0.9153
820	396.	83.	62.	145.	328.	474.	0.2607	0.9174	0.7090	0.7662	0.8958
840	403.	86.	63.	149.	309.	458.	0.2617	0.8793	0.7082	0.7746	0.8780
860	411.	89.	64.	153.	287.	440.	0.2627	0.8358	0.7073	0.7810	0.8624
880	418.	92.	64.	156.	264.	420.	0.2636	0.7894	0.7065	0.7859	0.8483
900	425.	94.	65.	159.	241.	400.	0.2645	0.7422	0.7058	0.7892	0.8357
920	432.	97.	66.	163.	218.	380.	0.2653	0.6959	0.7050	0.7906	0.8250
940	439.	99.	67.	166.	196.	362.	0.2661	0.6517	0.7043	0.7906	0.8155
960	446.	102.	67.	169.	176.	345.	0.2669	0.6104	0.7038	0.7895	0.8072
980	452.	104.	68.	172.	157.	329.	0.2676	0.5725	0.7032	0.7869	0.8002
1000	459.	106.	69.	175.	140.	315.	0.2683	0.5381	0.7028	0.7838	0.7939
1020	465.	108.	70.	178.	125.	303.	0.2689	0.5073	0.7023	0.7798	0.7886
1040	471.	110.	71.	181.	111.	292.	0.2694	0.4799	0.7020	0.7754	0.7839
1060	478.	112.	72.	184.	99.	282.	0.2700	0.4557	0.7016	0.7706	0.7802
1080	484.	114.	73.	187.	88.	274.	0.2706	0.4345	0.7013	0.7658	0.7767
1100	490.	116.	74.	189.	78.	268.	0.2711	0.4159	0.7010	0.7610	0.7738
1120	496.	117.	75.	192.	70.	262.	0.2717	0.3997	0.7009	0.7563	0.7712
1140	502.	119.	76.	195.	62.	257.	0.2722	0.3856	0.7007	0.7517	0.7694
1160	507.	121.	77.	198.	56.	253.	0.2727	0.3733	0.7006	0.7474	0.7674
1180	513.	122.	78.	200.	50.	250.	0.2733	0.3626	0.7004	0.7433	0.7658
1200	519.	124.	79.	203.	45.	248.	0.2738	0.3533	0.7003	0.7395	0.7643
1220	525.	125.	80.	206.	41.	246.	0.2743	0.3452	0.7002	0.7360	0.7634
1240	530.	127.	81.	208.	37.	245.	0.2748	0.3382	0.7001	0.7327	0.7623
1260	536.	128.	82.	211.	33.	244.	0.2753	0.3321	0.7000	0.7298	0.7613
1280	542.	130.	84.	213.	30.	243.	0.2758	0.3267	0.6999	0.7271	0.7602

TABLE IV. - Continued. TRANSPORT PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

(b) Continued. NO_2-N_2O_4-NO-O_2 system

Temperature, °K	Viscosity, poises	Thermal conductivity, cal/(cm)(sec)(°K)					Heat capacity, c_p, cal/(g)(°K)		Prandtl number		Lewis number
		Monatomic	Internal	Frozen	Reaction	Equilibrium	Frozen	Equilibrium	Frozen	Equilibrium	
Pressure, 30 atm											
300	124.X10-6	11.X10-6	24.X10-6	34.X10-6	55.X10-6	89.X10-6	0.2011	0.4123	0.7290	0.5712	1.5396
320	134.	12.	26.	38.	101.	139.	0.2068	0.5833	0.7315	0.5643	1.4590
340	147.	14.	28.	42.	164.	206.	0.2117	0.8235	0.7333	0.5863	1.3376
360	161.	17.	30.	47.	233.	280.	0.2155	1.1121	0.7351	0.6403	1.1837
380	178.	21.	32.	53.	282.	335.	0.2180	1.3636	0.7348	0.7243	1.0173
400	195.	26.	33.	58.	282.	340.	0.2193	1.4335	0.7317	0.8215	0.8710
420	211.	30.	34.	64.	231.	295.	0.2201	1.2572	0.7268	0.9000	0.7667
440	225.	34.	35.	69.	164.	233.	0.2212	0.9589	0.7218	0.9267	0.7126
460	237.	37.	37.	74.	112.	185.	0.2228	0.7007	0.7184	0.8970	0.7080
480	248.	39.	38.	78.	82.	160.	0.2250	0.5390	0.7163	0.8345	0.7570
500	257.	41.	40.	82.	71.	153.	0.2275	0.4581	0.7153	0.7710	0.8565
520	266.	43.	42.	86.	72.	158.	0.2301	0.4295	0.7149	0.7237	0.9736
540	275.	45.	44.	90.	82.	172.	0.2329	0.4324	0.7148	0.6933	1.0670
560	284.	47.	47.	94.	98.	191.	0.2356	0.4546	0.7149	0.6755	1.1210
580	293.	49.	49.	97.	117.	215.	0.2382	0.4890	0.7150	0.6657	1.1445
600	301.	51.	51.	101.	141.	242.	0.2408	0.5314	0.7149	0.6610	1.1491
620	310.	53.	53.	105.	166.	272.	0.2433	0.5788	0.7150	0.5600	1.1439
640	318.	55.	54.	109.	193.	302.	0.2457	0.6290	0.7151	0.6619	1.1321
660	327.	57.	56.	113.	220.	333.	0.2479	0.6798	0.7152	0.6661	1.1160
680	335.	60.	58.	117.	247.	364.	0.2500	0.7292	0.7149	0.6718	1.0976
700	344.	62.	59.	121.	271.	392.	0.2520	0.7751	0.7147	0.6793	1.0774
720	352.	65.	60.	125.	292.	417.	0.2538	0.8156	0.7145	0.6878	1.0563
740	360.	67.	62.	129.	310.	439.	0.2555	0.8490	0.7139	0.6973	1.0341
760	368.	70.	63.	133.	323.	455.	0.2571	0.8740	0.7135	0.7073	1.0123
780	377.	73.	64.	137.	330.	467.	0.2585	0.8896	0.7130	0.7180	0.9902
800	385.	76.	64.	140.	333.	473.	0.2599	0.8956	0.7124	0.7286	0.9688
820	393.	79.	65.	144.	330.	474.	0.2611	0.8920	0.7117	0.7386	0.9485
840	400.	82.	66.	148.	323.	470.	0.2622	0.8795	0.7110	0.7483	0.9290
860	408.	85.	67.	151.	312.	463.	0.2632	0.8594	0.7101	0.7568	0.9112
880	415.	87.	67.	155.	298.	453.	0.2642	0.8330	0.7094	0.7644	0.8945
900	423.	90.	68.	158.	281.	440.	0.2651	0.8018	0.7086	0.7709	0.8793
920	430.	93.	69.	161.	264.	425.	0.2659	0.7675	0.7078	0.7759	0.8656
940	437.	95.	69.	165.	245.	410.	0.2667	0.7315	0.7071	0.7798	0.8533
960	444.	98.	70.	168.	226.	394.	0.2675	0.6949	0.7064	0.7825	0.8420
980	450.	100.	71.	171.	208.	379.	0.2682	0.6589	0.7057	0.7836	0.8323
1000	457.	103.	72.	174.	190.	364.	0.2689	0.6242	0.7052	0.7839	0.8234
1020	464.	105.	72.	177.	173.	350.	0.2694	0.5912	0.7045	0.7831	0.8157
1040	470.	107.	73.	180.	157.	337.	0.2700	0.5605	0.7041	0.7816	0.8087
1060	476.	109.	74.	183.	142.	325.	0.2705	0.5321	0.7035	0.7790	0.8029
1080	483.	111.	75.	186.	129.	315.	0.2711	0.5062	0.7032	0.7762	0.7975
1100	489.	113.	76.	189.	116.	305.	0.2716	0.4828	0.7027	0.7728	0.7928
1120	495.	115.	77.	192.	105.	297.	0.2721	0.4616	0.7024	0.7692	0.7886
1140	501.	117.	77.	194.	95.	290.	0.2726	0.4427	0.7021	0.7653	0.7853
1160	507.	119.	78.	197.	86.	283.	0.2731	0.4258	0.7019	0.7614	0.7820
1180	513.	121.	79.	200.	78.	278.	0.2736	0.4107	0.7016	0.7575	0.7792
1200	518.	122.	80.	203.	71.	273.	0.2741	0.3974	0.7015	0.7537	0.7767
1220	524.	124.	81.	205.	64.	269.	0.2746	0.3855	0.7013	0.7499	0.7748
1240	530.	125.	82.	208.	58.	266.	0.2751	0.3750	0.7011	0.7462	0.7729
1260	536.	127.	83.	211.	53.	264.	0.2756	0.3657	0.7010	0.7429	0.7710
1280	541.	129.	85.	213.	48.	262.	0.2761	0.3574	0.7008	0.7396	0.7693

TABLE IV. - Concluded. TRANSPORT PROPERTIES AT ASSIGNED PRESSURE AND TEMPERATURES

(b) Concluded. NO_2-N_2O_4-NO-O_2 system

Temperature, °K	Viscosity, poises	Thermal conductivity, cal/(cm)(sec)(°K)					Heat capacity, c_p, cal/(g)(°K)		Prandtl number		Lewis number
		Monatomic	Internal	Frozen	Reaction	Equilibrium	Frozen	Equilibrium	Frozen	Equilibrium	
					Pressure, 100 atm						
300	123.X10-6	10.X10-6	24.X10-6	34.X10-6	31.X10-6	65.X10-6	0.2012	0.3171	0.7288	0.6019	1.5773
320	132.	11.	26.	37.	57.	95.	0.2072	0.4146	0.7310	0.5783	1.5278
340	143.	13.	29.	41.	97.	138.	0.2125	0.5547	0.7327	0.5725	1.4534
360	155.	15.	31.	46.	149.	194.	0.2172	0.7400	0.7350	0.5898	1.3483
380	169.	18.	33.	51.	205.	256.	0.2208	0.9571	0.7366	0.6315	1.2163
400	184.	21.	35.	56.	251.	307.	0.2234	1.1612	0.7371	0.6960	1.0732
420	200.	25.	36.	61.	267.	329.	0.2249	1.2740	0.7356	0.7755	0.9375
440	216.	29.	37.	67.	246.	312.	0.2258	1.2306	0.7316	0.8502	0.8293
460	230.	33.	38.	72.	198.	270.	0.2266	1.0532	0.7271	0.8976	0.7579
480	243.	37.	40.	76.	148.	225.	0.2277	0.8363	0.7230	0.9028	0.7263
500	254.	40.	41.	81.	111.	192.	0.2293	0.6581	0.7199	0.8692	0.7363
520	264.	42.	43.	85.	90.	175.	0.2313	0.5421	0.7180	0.8171	0.7884
540	274.	44.	45.	89.	82.	171.	0.2336	0.4796	0.7169	0.7663	0.8745
560	283.	46.	47.	93.	84.	177.	0.2360	0.4547	0.7164	0.7269	0.9698
580	291.	48.	49.	97.	92.	189.	0.2385	0.4542	0.7162	0.7002	1.0481
600	300.	50.	51.	101.	105.	206.	0.2410	0.4695	0.7158	0.6831	1.0983
620	308.	52.	53.	105.	122.	227.	0.2434	0.4950	0.7158	0.6731	1.1249
640	317.	54.	55.	109.	141.	250.	0.2457	0.5270	0.7159	0.6680	1.1344
660	325.	55.	57.	112.	162.	274.	0.2479	0.5630	0.7160	0.6665	1.1328
680	333.	58.	59.	116.	184.	300.	0.2500	0.6009	0.7158	0.6672	1.1247
700	341.	60.	60.	120.	205.	325.	0.2520	0.6392	0.7158	0.6701	1.1125
720	349.	62.	62.	124.	226.	350.	0.2539	0.6763	0.7157	0.6745	1.0979
740	357.	64.	63.	128.	246.	374.	0.2557	0.7110	0.7153	0.6802	1.0807
760	365.	67.	65.	131.	263.	395.	0.2573	0.7420	0.7151	0.6868	1.0631
780	373.	69.	66.	135.	278.	413.	0.2588	0.7684	0.7149	0.6945	1.0442
800	381.	72.	67.	139.	289.	428.	0.2602	0.7892	0.7145	0.7028	1.0250
820	389.	74.	68.	143.	297.	440.	0.2615	0.8039	0.7141	0.7112	1.0061
840	397.	77.	69.	146.	302.	448.	0.2627	0.8122	0.7135	0.7198	0.9871
860	404.	80.	70.	150.	303.	452.	0.2638	0.8141	0.7129	0.7281	0.9691
880	412.	83.	71.	153.	300.	453.	0.2648	0.8098	0.7123	0.7362	0.9517
900	419.	85.	71.	157.	294.	451.	0.2658	0.7998	0.7116	0.7440	0.9349
920	427.	88.	72.	160.	286.	446.	0.2667	0.7849	0.7109	0.7508	0.9194
940	434.	91.	73.	163.	275.	439.	0.2675	0.7658	0.7102	0.7571	0.9049
960	441.	93.	73.	167.	263.	430.	0.2683	0.7435	0.7096	0.7626	0.8911
980	448.	96.	74.	170.	250.	420.	0.2690	0.7188	0.7088	0.7669	0.8788
1000	455.	98.	75.	173.	235.	409.	0.2697	0.6926	0.7082	0.7707	0.8673
1020	461.	101.	76.	176.	221.	397.	0.2702	0.6655	0.7075	0.7733	0.8568
1040	468.	103.	76.	179.	206.	385.	0.2708	0.6383	0.7070	0.7752	0.8471
1060	474.	105.	77.	182.	192.	374.	0.2713	0.6116	0.7063	0.7759	0.8387
1080	481.	107.	78.	185.	178.	363.	0.2718	0.5857	0.7058	0.7762	0.8309
1100	487.	110.	78.	188.	164.	352.	0.2723	0.5610	0.7053	0.7755	0.8239
1120	493.	112.	79.	191.	151.	342.	0.2728	0.5376	0.7048	0.7745	0.8175
1140	499.	114.	80.	194.	140.	333.	0.2733	0.5158	0.7044	0.7726	0.8122
1160	505.	116.	81.	196.	128.	325.	0.2738	0.4955	0.7041	0.7706	0.8070
1180	511.	118.	82.	199.	118.	317.	0.2742	0.4768	0.7037	0.7681	0.8024
1200	517.	119.	83.	202.	109.	310.	0.2747	0.4596	0.7034	0.7655	0.7982
1220	523.	121.	83.	205.	100.	304.	0.2752	0.4439	0.7031	0.7626	0.7948
1240	529.	123.	84.	207.	92.	299.	0.2756	0.4296	0.7027	0.7595	0.7915
1260	535.	125.	85.	210.	84.	294.	0.2761	0.4166	0.7025	0.7565	0.7884
1280	540.	126.	86.	213.	78.	290.	0.2766	0.4049	0.7023	0.7535	0.7855

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